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INFLAMMATION OF THE FRONTAL SINUS; ITS CONSERVATIVE AND ENDONASAL OPERATIVE TREATMENT.

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If pathogenic micro-organisms enter a sinus or if bacteria previously present in such sinus becomes virulent as the result of a severe general disease, an acute inflammatory sinusitis results. For the most part, no single strain of organism is found as most cases show mixed infection. The most frequent inhabitants in the order named are: *Diplococcus pneumoniae*, *streptococcus*, *staphylococcus pyogenes*, influenza and diphtheria bacilli. The presence of micro-organisms is, of course, not pathognomic of disease as we know we find them in the secretion of healthy nasal cavities. Frequently, however, the entrance of bacteria is followed by acute sinusitis, especially if the patient has acute rhinitis, influenza, pneumonia, scarlet fever, measles, diphtheria, etc. It is not always possible to ascertain in the above-men-

tioned infectious diseases whether the sinus infection originated from an infiltration of bacteria from the nasal cavity or if the inflammatory process affected the whole system of cavities at the same time. Probably both forms occur. If directly after the beginning of a general disease a sinusitis is established, then we will not be wrong to suppose that we have to do with a primary process. On the contrary, if the trouble in the sinus does not start until after the rhinitis has existed for some time, then it is probable that the infection entered the sinus from the nasal cavity. One group of rhinologists take the stand that the inflammatory sinus disease is a result of direct extension of infection along the mucous membrane layer, while another group feel that invasion *via* the blood stream is the more probable.

We all know that the majority of acute inflammatory sinus diseases heal spontaneously with conservative treatment, and we also know that many acute cases become chronic. The reason for this lies in local conditions, especially if the drainage and ventilation conditions are poor, or if an obstruction exists in the cavity of the nose which blocks the ostia of the sinuses. For example, polyps in the middle meatus, a deflection of the septum which is crowding the middle turbinate to the lateral wall, edematous conditions of the mucous tissue, can all produce such an obstruction. We see the chronic affections of the sinus following the secondary invasions, rather than the primary infections of the sinuses. Frequently repeated acute attacks of sinusitis will result in a chronic infection. It may also be true that the virulence of the bacterium is, in some cases, the cause of the establishment of a chronic disease.

Pathological Anatomy: In a case of sinusitis, the mucous membrane of the sinus shows the picture of simple mucous membrane inflammation in the form of redness, swelling and the edematous infiltration. Histologically, we find the tissue in acute inflammatory disease changed and showing atypical character. We find hemorrhages in the mucous membrane and edematous swelling of the whole tissue, sometimes cysts which have a cylindrical pseudomembrane. In chronic sinus cases we differentiate two stages. The first, which Killian called the edematous, shows a serous infiltration, with a few round cells, from which may result a polypoid degeneration. The second, or fibrous stage, which develops from the first after a term of years, is characterized by an enormous immigration of round cells into the tissue and by changing of mucous to fibrous tissue. Sometimes we find that the cylindrical epithelium becomes squamous. The periosteum, which lies under the mucous layer, is frequently infected. It can cause increased thickness of bone. The secretion in

acute cases is seromucilaginous or purulent, but is seldom fetid. The secretion in chronic cases nearly always is of a mild fetid character.

Symptoms of Frontal Sinus Disease and Its Progress: First, we must divide the symptoms into those which are subjective and the others which are objective. Under the first we enumerate the headaches of different forms, the bad odor of which the patients complain, and the discharge. Sometimes the headache is of a diffuse character, at other times the pains are of a neuralgic form, while again the headache is definitely localized in the forehead and behind the eyes. These headaches vary in intensity. We find an augmentation if pus is retained in the frontal sinus, and a diminution or entire disappearance if for a time the sinus be free of secretion.

Among the subjective symptoms I mention the bad smell caused by the fetid pus in chronic cases. A principal symptom is the excretion of a mucus or a mucopurulent exudate, which is produced in the sinuses and penetrates into the cavity of the nose. The quantity is variable. In acute suppurative cases it is not seldom we see, in the cavity of the nose, a constant pus stream. This occasionally occurs in chronic cases, especially if more than one sinus is involved.

Besides the discharge which we find on examining the nose, belong also the pathological changes in the mucous membrane in the form of polyps, which originated from a chronic suppuration. The mucous membrane, especially in chronic cases, is constantly irritated by the pus and this continuous irritation produces a hyperplasia of the mucous membrane and the production of polyps. Of the other general symptoms, I mention only pharyngitis, especially the dry rhinopharyngitis, which occurs only in chronic cases. In acute cases we nearly always find fever, particularly if the drainage conditions are bad and pus is retained in the sinus. The secretion can readily be retained in the frontal sinus as the excretory duct is long and sometimes very narrow. If the inflammation oversteps the confines of the frontal sinus, the resulting process is considered a complication. We find as such a complication the not so rare inflammatory edema of the skin of the forehead or eyelids, chemosis, and sometimes exophthalmos. Such edemas are indicative of severe infection.

If the pus is retained for a long time, we see destruction of the bony walls, and pus penetrates into the surrounding tissues. We get a fistula if the pus penetrates the anterior wall, or into the orbit, or through the inner wall into the brain. Sometimes we have cerebral symptoms without actually having a meningitis or the production of a brain abscess, in cases where pus is retained as: Slowing of the pulse, dizziness and vomiting. The etiology of the symptoms is supposed to be due to toxins. If after obtaining good drainage

condition the symptoms continue, it is a strict indication for us to operate.

Diagnosis: A spontaneous pain in the region of the frontal sinus is suspicious of disease in that sinus, especially if the anterior wall and the floor of the sinus are sensitive to pressure or knocking. The anamnesis (acute rhinitis, infectious disease, accident), pus in the middle meatus, sometimes seen only after cocaineizing, and the X-ray pictures are all helping to verify our diagnosis. It is not advisable to make irrigations in the beginning of an inflammation as complications may result. If we are dealing with an enclosed empyema we arrive at our diagnosis if we get secretion in the nose after lifting up or resecting the anterior tip of the middle turbinate.

Differential Diagnosis: The neuralgia starts without any evident cause. Pains start suddenly, followed by painless intervals. The pain in the frontal sinus starts following a rhinitis of several days' duration, and the pain becomes more intense without having the typical attacks that real neuralgic pains produce. In a case of supraorbital neuralgia we have a typical spot which is very sensitive to pressure, and that is over the supraorbital foramen, while in an inflamed frontal sinus the pains become more intense if we press toward the floor of the sinus from the orbit. A permanent pressure alleviates the pain if we have to do with a neuralgia, whereas with a sinusitis the pain increases with the increase in pressure. The movement of the muscles (chewing) increases the pain in neuralgia, but does not produce a change of pain in a frontal sinus involvement. Sinus pains increase with augmentation of blood pressure (coughing, bowing, etc.). In cases of pain due to inflammation in the frontal sinus, if not at once, at least after repeated examination, using cocaine, mucus or pus will be seen exuding from the middle meatus. We have still further differential criteria: If we give chinin, arsen or iodin the pain diminishes in neuralgia and increases in frontal sinus disease, whereas we get a good effect in frontal sinusitis from applying cocaine to the anterior tip of the middle turbinate.

Prognosis: The prognosis in the acute cases of frontal sinus inflammations depends principally on the drainage conditions. If we have a retention of secretions the danger of complications is present. Retention of the secretion is also the principal etiologic factor in the production of a chronic case. The original disease and the virulence of the organism are also important factors.

Treatment of the Acute Frontal Sinus Inflammation: All sinus inflammations show a tendency to heal. Therefore, in a case of acute frontal sinus disease, conservative treatment will probably produce a favorable result. We keep the patient in bed, induce him to perspire,

we use headlights and let him inhale etheric oils. For the pain, we use pyramidon, sometimes morphin. Some specialists use cocain-adrenalin applications several times a day, in the form of a spray. I agree with Halle, who does not recommend the use of adrenalin, as we both have seen severe attacks of sneezing. The use of cocain is always sufficient and does not cause such severe reactions. The method of aspiration is absolutely not recommendable. I have seen severe bleeding follow the use of that method. Furthermore, irrigations in acute cases are not recommended, since they cause irritation of the mucous membrane. It is much better to resect the anterior tip of the middle turbinate, if we have retained secretion. Halle goes further and resects the septum, should that be the cause of the retention. If I can avoid it, I prefer to await the abatement of the acute symptoms before attacking the septum.

Indications for Opening the Frontal Sinus: If all symptoms of the acute inflammation are increasing in spite of our conservative treatment, if danger of complications is present, especially symptoms of perforation of pus through the anterior wall into the orbit, or perforation into the cranial cavity, we cannot delay operation.

Chronic Inflammations of the Frontal Sinus: The chronic form results, as I have already mentioned, from the acute, especially if the secretion is retained or if the patient has had several attacks of acute inflammation.

Certain aspects of the pathological anatomy I have already discussed. It should be also stated that the mucous membrane, which is normally thin and tender, augments in chronic disease so that the anterior and posterior epithelial walls of the frontal sinus are in contact with each other. Such swelling of the mucous membrane can very rapidly produce an occlusion of the nasofrontal duct, so that even a small quantity of pus may produce symptoms of pus under pressure.

Symptoms: The subjective symptoms of chronic frontal sinus suppuration are nearly the same as the suppuration of all other sinuses. If the opening is not blocked, pain may be entirely absent, the patient's only complaint being more or less secretion from the nose. More frequently, the chronic suppurative case produces pains which are similar to the pains in acute cases, but less violent. The patients feel pressure in the forehead or have atypical headache in the frontal region. A typical symptom, which was discovered by Kuhn, is the sense of pressure in the nasal process of the superior maxillary bone. Not infrequently, we find neuralgic pain accompanying the chronic frontal sinus suppuration.

Objective Symptoms: In examining the nasal cavity, we see in nearly all cases a distinct swelling of the anterior end of the middle turbinate, and sometimes the mucous membrane shows polypoid tissue. The excretory duct is enlarged in chronic cases so that probe enters easily. In cases having favorable drainage conditions, we frequently see a constant secretion coming out below the anterior end of the middle turbinate, as we have there the opening of the nasofrontal duct. The secretion itself shows varying character; it is rarely serous, more often mucopurulent or purulent. The nasofrontal duct can be constricted by a prominent uncinat process, by enlargement of the middle turbinate or a high deflection of the septum, and again polyps are the obstructing agents.

If the pus is retained, we get very easily a necrosis of the bony wall and the pus breaks through the bone and we have a fistula. Otherwise, we get edema of the orbit and an orbital abscess, or if the pus breaks through the inner wall we get a meningitis or an extradural abscess.

Prognosis: The outcome of chronic frontal sinus suppuration depends principally on the drainage and the condition of the sinus walls. Drainage is very unfavorable in a frontal sinus with big recesses above the orbit and bad outlet conditions. Polyps and swollen mucosa can also be hindrances.

Not rarely we find that a frontal sinus with a cheesy fetid secretion heals after a few irrigations. On the contrary, we find cases with a mucous or mucopurulent secretion which show no healing tendency. Further, we must not forget that the outcome of inflammations of the frontal sinus depends very much on the infection of the surrounding tissues, especially the anterior ethmoids. The presence of a general infectious disease is a prognostic factor of great importance as the patient's resistance is weakened by that complication.

Treatment of the Chronic Suppurations: We have to differentiate between a conservative and a radical surgical treatment. The conservative treatment includes removal of retained secretions, removal of all hindrances to a perfect drainage, evacuation and cleaning the cavity.

Conservative Treatment: The most important help in conservative treatment is irrigation. We obtain, with regular irrigations with physiologic saline solution at body temperature a fundamental cleansing of the diseased sinus and we hinder the retention of secretions. In this way we very frequently succeed in obtaining a perfect cure. Hajek recommends putting 2 per cent silver nitrate solution in the sinus after the washing out, but in my opinion local treatment with

any medicament is unnecessary, it being quite sufficient to totally remove the secretions from the sinus. If the mucous membrane still has the power to return to normal, it does so without any other help than irrigations and ventilation. In addition, it is wise to induce perspiration and to use headlight baths.

Results of Irrigation Treatment: The irrigation treatment has the purpose of cleansing the sinus completely of secretion. This is not always possible, as when the cannula so nearly blocks the duct as to prevent the passage by it of thick pus. In such cases it becomes necessary to enlarge the nasofrontal duct. Besides this, we know that the large frontal sinus with many recesses is very difficult to wash out completely, and we are surprised at the amount of pus found in those recesses if we have to open the sinus externally, although the sinus has been washed out every day.

Finally, we do not obtain results with the irrigations because the mucous membrane is so much diseased that we cannot get an involution to the norm and a radical removal of the diseased parts of the mucous membrane is the only possibility of obtaining permanent healing. It is impossible to state exactly in what per cent of cases we obtain a cure of a chronic frontal sinusitis with irrigations, but we know from our experience that in many cases the subjective symptoms disappear entirely and, also, the putrid secretion ceases.

Taking the experiences of different authors, we may assume that in about 90 per cent such good therapeutic results are obtained. This affirmation has a real value, as we know very well today that radical operative measures do not yield a higher percentage of cures. The patient himself must supplement our special treatment with regular irrigations of his nasal cavity with 1 per cent boric acid solution. Some cases require treatment for several months before we obtain perfect healing.

Indications for the Irrigation Treatment of Chronic Frontal Sinus Suppuration: All rhinologists are at the present time united in the opinion that all chronic frontal sinus suppuration should be treated by irrigations as long as no complication manifests itself. If technical difficulties exist they must be removed. How long one should persist with useless conservative treatment and withhold radical operation depends on various circumstances. In the final analysis, conservative treatment is to be preferred as the radical gives no higher percentage of cures.

Endonasal Remedial Operations for the Enlarging of the Frontal Opening: We know that if we cannot enter a probe into the frontal duct, we have to employ remedial help operations to enlarge the duct or frontal sinus opening. It has been frequently observed that with

this preparatory operation, chronic frontal sinus suppurations have healed. We can explain this fact by the knowledge that the chronic inflammatory sinusitis originated from a retained secretion.

For the endonasal redeeming and enlarging of the frontal sinus ostium the following operations are under consideration:

1. Removal of a high deflected septum which is pressing the middle turbinate toward the lateral wall.

2. Resection of the anterior end of the middle turbinate, which was first done by Killian. The technique is described in a few words. We paint the middle turbinate with cotton applicators dipped in 10 per cent cocaine and adrenalin, or we inject a 0.5 per cent solution of novocain into it, and after that we cut the anterior attachment off and push it down with nasal scissors, then we take the piece off with a snare.

One can say that the resection of the middle turbinate is the most important remedial help operation in the conservative treatment of frontal sinus inflammations. After the resection, in the majority of cases, we find that the entrance to the frontal sinus is so free that we can readily enter probes and tubes so that irrigations may be conveniently carried out. Soon we find that good drainage for the secretions has been established.

3. Enlarging of the frontonasal duct, removing anterior ethmoidal cells and opening of the bulla. The shortened Halle operation.

Experience shows that during a chronic frontal sinus inflammation the nasofrontal duct enlarges itself. Sometimes, of course, it is narrowed by swollen mucous membrane or by polyps. In such cases the new-formed inflammatory tissue must be removed by snare or chonchotome. At the same time anterior ethmoidal cells which are laying in the way have to be removed with curettes, hooks, spoons or chonchotomes to obtain a free duct passage. If there is absolutely no possibility of entering the duct, in spite of the above-mentioned remedial help operations, I recommend doing an endonasal opening after Halle, a method which I shall discuss later.

4. Resection of the unciform process. In some cases the unciform process is so greatly developed that it is a considerable hindrance to treatment of the frontal sinus. In such cases it must be removed.

Unpleasant Accidents in Doing the Endonasal Remedial Help Operations: If we are careful in our work they are not to be expected, but we must always bear in mind that we are working in a dangerous situation and very often without control by view. Kimmel published a case of fatal meningitis after an endonasal resection of the middle turbinate. Fortunately, these unpleasant accidents are rare.

Endonasal Operation on the Frontal Sinus: The first who opened the frontal sinus endonasally was Schaffer, who broke through the floor of the sinus between the septum and middle turbinate with a solid 2 m.m. thick probe. Then he curetted the sinus and treated it with a 5 per cent chromic acid solution. This method was soon discarded as we recognized that the only logical endonasal route to the frontal sinus is *via* its natural excretory duct, and only by enlarging this duct are we able to obtain access to the frontal sinus without danger. To get space enough, the compact bony wall which lies in front of the duct and the anterior ethmoid cells has to be removed. Fletcher used a drill for the removal of this bony mass. His first procedure was to enter the sinus with a thin metal probe, over which he passed a hollow drill, with which he removed part of the frontal sinus. The danger of injuring the surrounding parts, especially the tabula vitrea and with it the dura, was very great. In 1906, Halle demonstrated that we could obtain a broad communication between the frontal sinus and the cavity of the nose by removal of the bony mass which forms the floor of the frontal sinus, the internal nasal spine. In the beginning, Halle encountered great opposition, the majority of rhinologists called his method dangerous, technically difficult and unsurgical. In 1911, Halle perfected the method and the instruments in such a way that his method found more and more followers. The excellence of his results brought about a great change in the estimate placed on his method. Not only are the cosmetic results splendid, as we see nothing externally, but the therapeutic results are satisfactory if we follow Halle's technique. Working with a drill in such a dangerous region is not without hazard, although Halle has constructed drills with which bad accidents are eliminated, so he says. However, I myself never work with an electric drill in a Halle operation, as I shall describe later.

Since Halle's operation is favored more and more, we will describe it very plainly, at first the method of the inventor and then my modification. I modified the method to make it technically easier and absolutely safe.

Preparation for the Operation: The nose is cleaned externally with alcohol and iodin benzin, the head is covered with a sterile drape. *Anesthesia:* Local infiltration with 0.5 per cent novocain solution, with a few drops of adrenalin, of the lateral nasal wall and in the skin above the root of the nose. The head of the patient is laying inclined posteriorly and is fixed by an assistant. If a deflection of the septum proves a hindrance, it must be removed before proceeding further. On the lateral nasal wall we now form a mucoperiosteal flap, which we make by means of a long knife. The cut

begins on the nasal roof as high as can be reached, it then curves around the anterior attachment of the middle turbinate from above and posteriorly, ending below the anterior tip of the middle turbinate in the middle meatus. This cut is continued on the nasal roof to the pyriform aperture and turns here posteriorly and below, to end in the region of the anterior attachment of the inferior turbinate. It is essential to cut cleanly through the mucosa and periosteum as it would be difficult to repeat the three cuts, as vision is obscured by bleeding. It is absolutely necessary that the cuts intersect at the angles or in our dissecting we shall destroy the flap. The flap is now freed with an elevator and pressed carefully down over the inferior turbinate, where it is protected with a pad of gauze. The *agger nasi* in front of the attachment of the middle turbinate is cut off with chisel or scissor and the turbinate is pushed toward the septum. Then Halle removes the *agger nasi* and a part of the ascending maxillary process with chisel strokes. The work is absolutely safe, as it is always controlled by direct view. To more rapidly enlarge the field of vision, he uses the pear-shaped drill, which is polished smoothly on the anterior part so that an injury by a less experienced rhinologist is impossible. However, Halle himself states that the drill is unessential here or elsewhere. Directly after the first few chisel strokes, we find the ethmoid cells filled with pus. If the pieces of bone cut off by the chisel are removed, it is not difficult to clean the ethmoid cells and maintain perfect orientation of the operative field. We definitely recognize the bending place of the posterior frontal wall, posteriorly we see all the anterior cells of the ethmoid labyrinth, we see their lateral attachment to the paper plate, and we have the possibility to clean them out entirely under the control of our eyes. The protected middle turbinate gives us perfect protection from an improvident injury to the cribriform plate. We are absolutely safe as the cribriform plate is located between turbinate and septum and we are working external to the turbinate. With what instruments we choose to clean out the ethmoidal cells, whether spoon, curette or forceps, makes no difference. In every way, we must get a perfect result as we see clearly the roof of the ethmoid, the paper plate, and since we are protected against injuring the cribriform plate by the middle turbinate, which remains in its place. We now push a Ritter bougie into the frontal sinus and we enlarge the opening by using thicker and thicker probes. After this, Halle removes, with one of his drills which are carefully polished on the end, the internal nasal spine. Halle states that an injury of the cribriform plate or the internal frontal sinus wall is absolutely impossible, even if we mistakenly work directly toward these dangerous places. The spine is removed very rapidly, working from above downward and from posterior to

anterior directions. At the end of the operation, Halle takes a conical drill to smooth the large opening into the frontal sinus. If one does not wish to work with the drills, he can perform the removal of the floor of the frontal sinus with a chisel, but Halle is of the opinion that work with the chisel is more dangerous and more disagreeable to the patient.

If we work with the chisel, we choose a backward-bent hollow chisel, after West. The opening which we obtain varies between 1x1.5 to 2x3 c.m. and it is not difficult to enter with flexible spoons and curettes and to remove, if necessary, the whole mucous membrane. Anteriorly and laterally, there is no danger at all, but we must use care in curetting the posterior wall and the medial part of the frontal sinus. These curettes are readily flexible so they may be given the necessary shape, and force is unnecessary. It is not essential to remove the mucosa with the exactitude used in the external operation, where obliteration of the sinus is our objective. We expect to keep the sinus open with good drainage and ventilation and we expect a cure of the sinusitis by the permanent air passage. At the close of the operation, we replace the flap in position and the posterior corner reaches the entrance of the frontal sinus. The flap is kept in position by means of a small gauze pad and it heals in a few days. It takes Halle 15 to 30 minutes to perform this operation.

My Modification: For everyone who has not had the large amount of practice which Halle has had, the formation of the flap is technically difficult. You must realize that it is difficult to place the knife in a position vertical to the mucous membrane of the lateral wall and, further, that if we do not cut cleanly through the mucosa and periosteum we cannot repeat the incision, as the cut is obscured by bleeding. Besides, if care is not taken to see that the three cuts cross at the intersections, the flap will be torn in preparing it. The most difficult cut is Halle's posterior one, which is cutting around the attachment of the middle turbinate. The second, on the bridge of the nose, is easier, and the easiest is the last one, as it lies in front at the pyriform aperture.

I start with this last one, which I make on the inside of the pyriform aperture to the head of the inferior turbinate. From this incision, I start to prepare a periosteal pocket high up above the attachment of the middle turbinate so that the agger nasi is plainly exposed to view. Now, the middle turbinate is cut off with scissors. After this, I place the knife in the pocket with the blade up to the bridge of the nose and cut the flap so that two sides of a triangle result. With a gauze pad I push the flap down until it lies over the inferior

turbinate and here it is protected by a pad of gauze. The advantage which I claim for this modification is that I have simply to make Halle's easiest cut first and then dissect in a manner similar to a submucous septum resection, a mucoperiosteal flap, until a pocket results. The second cut, I perform from *inside* the pocket, cutting toward the bridge of the nose. If the flap is not cut cleanly through the first time, no harm results, as the knife can be again placed within the pocket and the cut repeated as often as is necessary, until a triangular flap results. Halle's most difficult cut I do not at all, as I roll the flap down. A still further advantage of my modification is that bleeding occurs from one incision only, and that in preparing the flap I am not disturbed by the bleeding. As soon as I have turned down my flap and before removing the agger nasi, I push a small Ritter probe into the frontal sinus. This probe I leave in position as long as I am working on the agger nasi. Thus, I am always chiseling toward the probe, exposing more and more of it, so that I have the great advantage that my chisel can never cut too far backward or in a wrong direction. As soon as I have removed enough of the agger nasi, and as soon as I see the opening of the frontal sinus free, I radically clean out the ethmoid. Then I remove the internal nasal spine with a curved West chisel or the Good method, with curved rasps of different sizes, which cut forward only, but I never use a drill.

Halle himself affirms that he cannot obtain a cure in every case by his method, especially in large sinuses, which can never be thoroughly cleaned out, but that he obtains the best conditions for a cure even in these cases, through a broad access to the frontal sinus, made so that the pus can flow out properly and irrigations can be used.

Indications for the Operation: The operation is indicated in acute and chronic cases of frontal sinus suppuration as long as no complications (perforation, pus through the anterior wall, or to brain, or orbit, or orbital symptoms) are present. A deflected septum has to be removed previously or at the same time. In 1922, Halle stated that, in a series of 850 cases, only two required external operations. He had only five cases which proved fatal through a convexity meningitis *via* the lymphatic vessels.

In his discussion at a congress in 1923, Halle stated that for the last several hundred cases operated upon by this method there were no accidents at all and that none of the complications previously reported could be attributed to the operative method.

From my own experience, I can confirm Halle's words.

IX Alserstrasse 18.

**FRACTURE OF FRONTAL SINUS AND ETHMOID
THROUGH DURA, ORBIT AND MAXILLARY
SINUS. CASE REPORT. A PHENOMENAL
RECOVERY.***

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Case No. 77185: A colored woman, domestic, age 39 years, was admitted to the accident ward of the Graduate Hospital on May 18, 1929, in a state of shock, following hammer blows to her head. After immediate care for shock and hemorrhage she was transferred to the service of Dr. George B. Wood and later to the service of Dr. F. C. Grant.

The tentative diagnosis on admission was: Extensive laceration of face and scalp, fracture into frontal sinus, fracture of left mandible and superior maxilla, fracture of nose.

About 10 hours after admission to accident ward the wounds were examined and dressed under oral ether anesthesia by Dr. Wood and myself.

The following lesions were noted: Compound comminuted fracture of left nasal bone, roof and inner wall of orbit and nasal process of left superior maxilla, opening into frontal, ethmoidal and maxillary sinuses, respectively. The left eye was displaced downward and outward and left facial hemiplegia. Portion of pinna of left ear removed, with extensive laceration of skin and tissues anterior to left mastoid process, no bone involved. Profuse escape of cerebrospinal fluid, through the nasofrontal wound indicated fracture into the anterior cranial fossa.

The wounds were not disturbed, gauze dressing applied loosely.

Several hours after the preliminary examination it was thought advisable by the neurosurgeon to do an exploratory transfrontal craniotomy, as a result of which the following lesions were noted: Laceration of dura, fracture of cribriform plate of left ethmoid and free escape of cerebrospinal fluid. The postoperative condition of the patient was good. A general blood examination on May 28, ten days after admission to hospital, was as follows: Erythrocytes, 3,080,000; leukocytes, 8,500; hemoglobin, 44; small lymphocytes, 32; transitionals, 3; polymorphonuclears, 65. Anisocytosis to a slight degree.

*Read before the Philadelphia Laryngological Society, Dec. 2, 1930.

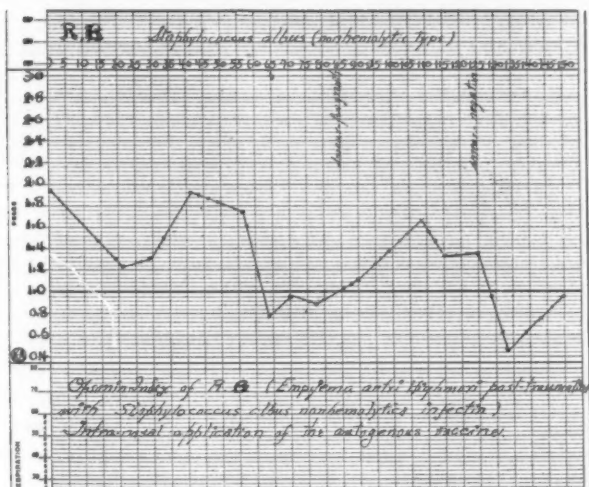
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Convalescence was uneventful.

Temperature ranging from 100.2° on admission, 101.2° following craniotomy, to 102.4° , the highest recorded 48 hours after admission. The pulse and respiration ratio was in proportion to rise and fall in temperature. The patient was discharged on June 14, 26 days following admission.

To continue the study and correct several errors of omission, the patient was readmitted to the hospital on July 29.

One pregnancy, which terminated in spontaneous abortion, was the only relevant fact bearing on her past medical history. Facial paraly-



sis was limited to disability in elevating the left upper lip, involving the levator labii superioris, which is innervated by zygomatic branches of the facial. The left nasal fossa was narrowed above, encroached upon by the depressed outer wall.

Ocular Findings (by Dr. Edmund B. Spaeth, on June 24): Vision, 20/40. The left eye showed external results of recent trauma, and swollen edematous lids. The nerve head was pale, with blurred margins, infiltrated. Veins were overfull and tortuous. Wassermann was strongly positive, and Kahn was positive also. External appearance showed laceration with obliquity of palpebral fissure running

down over inner canthus to the malar process in a fan shape. There was another short laceration at the inner canthus of the nose and a third one over the inner canthus, obliquely across the forehead toward the midline.

In the left eye, in addition, there was an incipient cortical cataract. I am of the opinion that her optic nerve atrophy on the left is more likely luetic, rather than traumatic, in that both eyes are similar, and the development of this atrophy could not have occurred as rapidly as it did. Her vision, Oct. 23, 1929, was 20/70 in the right eye and 20/50 in the left eye.

X-ray findings on July 29 were as follows: Evidence of trephine in the left frontal area, measuring 5 c.m. in diameter; there are still two suture clips remaining. There is evidence of bone absorption around the trephine. This area extends from a line drawn through the suture portion of the frontal sinus directly posterior for a distance of 5 c.m. Sphenoid large and clear, left antrum shows some thickening in the inner aspect. There is also some encroachment on the left ethmoid region and opacity of the same. The frontal sinuses show a moderate opacity.

General blood examination, Aug. 2: Erythrocytes, 5,520,000; leukocytes, 5,300; hemoglobin, 50 per cent; small lymphocytes, 40; polymorphonuclears, 60; slight anisocytosis.

A serologic examination at this time showed a strongly positive Wassermann reaction to the complement fixation and a moderately positive to the precipitation tests of Kolmer and Kohn, respectively.

Cyto- and serologic abnormalities, as previously outlined, suggested study of the phagocytic activity of the leukocytes. For the technical work in obtaining the opsonic index I am indebted to Dr. Amana. A culture made from an intranasal smear revealed the presence of *staphylococcus albus* nonhemolytic. An autogenous vaccine applied to the nasal mucous membrane, on cotton tampon, at approximately five-day intervals, over a period of 150 days, manifested results as outlined in the appended chart, prepared by Dr. Amana. The negative and positive phase, as described by Sir A. E. Wright, is clearly indicated.

The nature of the lesions which predisposed to cavernous sinus thrombosis, meningitis, septicemia and malignant erysipelas suggested a grave prognosis.

In conclusion, therefore, one may but surmise that phagocytosis of the leukocytes and endothelial cells played an important role in recovery.

Following are some laboratory studies made by Dr. Amana:

R. B. Diagnosis: Empyema antri Highmore post-traumatica. Organism: *Staphylococcus albus* (nonhemolytic type), Aug. 1, 1929. Summary of Immunological Treatment: The autogenous vaccine (in physiological saline solution) was applied locally in nasal cavities by cotton tamponade saturated with it or by installation at the position of Dr. Proetz's displacement method. The dose applied was 1 c.c. each for both nostrils each time; for 30 minutes when tamponaded.

The vaccine application numbered 39 times from Aug. 21 to Dec. 28. The opsonic index was taken 13 times from Aug. 1 to Dec. 28. The result of the above treatment seems very favorable and the mucous membrane is less catarrhal, with less mucus, and with less nasal obstruction. The bacteriological examinations were negative on Nov. 17 and Dec. 19. The pus discharge was not apparent since November. The opsonic index is as follows:

	Patient	Control	O. I.
Aug. 1.....	1509	763	1.97
Aug. 21.....	30	24	1.25
Aug. 29.....	53	37	1.30
Sept. 1.....	169	86	1.96
Sept. 25.....	371	211	1.75
Oct. 9.....	149	158	0.94
Oct. 16.....	102	116	0.88
Oct. 28.....	1298	1125	1.15
Nov. 8.....	133	78	1.79
Nov. 24.....	94	71	1.28
Dec. 2.....	182	141	1.30
Dec. 11.....	202	491	0.41
Dec. 28.....	185	134	1.40

The above numerals are of numbers of organisms found in 100 polymorphonuclear cells each, in the phagocytosis conducted by the patient's serum and the normal serum.—AMANA.

Central Medical Building, 18th and Chestnut Streets.

ANTROTOMY IN CHILDREN DURING TONSILLECTOMY.

DR. SIMON STEIN, New York.

Children with their complex sensitive mechanisms present a definite problem to the physician. The slightest irritation or infection may produce intense reaction, both general and local, with complications either immediate or remote. Sinusitis is present in far greater number than heretofore appreciated and is responsible for a great many of the diseases and complications of childhood.

This preliminary report will deal with infections of the accessory sinuses met with in routine private practice. I have assembled a group of 443 cases of antral infections that were brought to my office for tonsillectomy, ranging in age from 1½ to 10 years. These cases had a sinusitis in addition to the diseased tonsils and adenoids, and the sinuses were drained at the time of the tonsillectomy and adenoidectomy.

The antrum first becomes evident about the fifth month of fetal life. At birth it is a definite cavity, which is filled by a duplication of membrane that shrinks up on exposure to air. Children may be born with sinus involvement, due to either birth injury or infection from the vaginal discharge. The antral cavity at this time is small and limited in its expansion by the unerupted tooth buds.

The symptoms of sinus infection in children are persistent nasal discharge, nasal block, repeated colds, temperature, loss of appetite, poor development, reflex cough and anemia. These children usually have accompanying diseased tonsils and adenoids, for which they are operated.

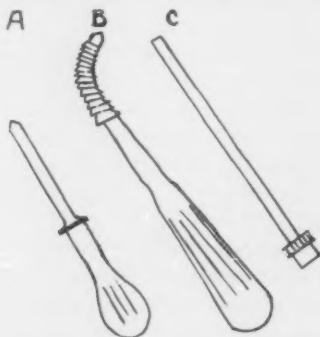
Amongst children who had their tonsils and adenoids removed within the past three years, 116 came back with a persistence of symptoms, which on examination proved to be due to sinus infection. The discharge was a thin, watery or a thick, purulent one, involving either one or both sides. These return cases gave a history of a heavy nasal discharge or frequent colds previous to the tonsillectomy, which symptoms were ignored by the surgeon and the condition overlooked.

It has been my experience that out of 140 cases, 24 mild sinus infections cleared up after a tonsillectomy and adenoidectomy, and the balance of 116 came back showing no appreciable change in their symptoms. Because of this fact, and as I could not see the necessity

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of subjecting these children to another operative procedure, I started during the year 1928 to puncture and open wide the antral sinuses in children who showed any marked intranasal discharge or gave any of the symptoms of accessory nasal sinus infection previously noted. This was done at the time of the tonsillectomy and adenoidectomy in 443 cases. I was surprised to note the following when these children returned to me for examination at the end of a week:

1. The discharge had entirely disappeared in 250 cases.
2. The discharge had materially decreased in 103 cases.
3. The discharge had changed in character from a thick mucus or purulent one to a more fluid type in 90 cases.
4. The symptoms had disappeared entirely in 250 cases.
5. The symptoms were lessened in severity in 193 cases. The 193 cases who still showed evidences of the infection responded to simple suction and baking under the infrared lamp, within a period of from one week to three months.



Dean recommended the puncture of sinuses in children, where the removal of tonsils and adenoids had not given good results.

Technique of Operation: The technique I have employed in draining the antrae is a very simple one. Immediately after the tonsils and adenoids have been removed, and bleeding controlled, I puncture each antrum, using a straight trocar (a). This is inserted under the inferior turbinate, which at times has to be elevated in order to provide space for the instrumentation. The elevation of the inferior turbinate is done by the trocar, the point of which is then pressed against the lateral wall of the nose and directed towards the outer canthus of the eye. After entrance is made into the antrum, the anterior wall is broken down by a backward movement of the instrument. In the greater majority of the cases this gives a large enough

opening for drainage. Where this is not sufficient, in older children especially, a rasp (b) is used to give the proper opening, which should freely admit a long metal suction tip (c). I find it unnecessary to use a biting forceps, which in my opinion causes more bleeding. Ordinarily no packing is used, although I have found it necessary from my experience to use packing in those cases where a previous tonsillectomy has been done, and the child is brought back for the relief of sinus symptoms, as in the 116 cases referred to.

Postoperative Treatment: As previously stated, 250 of these cases were entirely cleared up at the end of a week, 207 of them having been children with a thin mucopurulent discharge. The following cases required subsequent treatment: *a.* In 100 cases of long standing, as in older children, where the discharge was very heavy. *b.* In 93 cases, where there were accompanying systemic symptoms in other parts of the body, *e. g.*, pyelitis, joint involvement, cardiac, etc.

The treatment given was as follows:

1. *Suction*, using a long, narrow metal tip, which gently and quickly clears the nose of any discharge. This gives a minimum of discomfort and no trauma or edema, as does any other method which blocks the nares.

2. *Baking* under an infrared lamp from 8 to 10 minutes. I have found this lamp to be more efficient than the radiant heat lamp, which uses a 1500-watt blue bulb. The latter gives a penetrating light, which is very annoying to the patient. The infrared unit also gives off certain rays which may be beneficial. It was unnecessary to wash the antrums of any of this group of cases. Ephedrin solution is used to shrink up the tissues, followed by neosilvol drops for its germicidal effect.

These cases reported were operated on and treated postoperatively under my direct supervision. I have intentionally omitted those operated or treated in the hospitals or clinics with which I am associated, in order that the technique and postoperative treatment used be the same.

I consider every child brought to me with the following symptom complex as a definite sinus infection:

1. A history of *a.* frequent nasal colds; *b.* persistent nasal discharge and intermittent nasal block; *c.* varying temperatures; *d.* headaches; *e.* loss of appetite; *f.* underdevelopment and anemia.

2. Where an examination shows a nasal mucous membrane that is either slightly congested, with a thin mucus discharge on the floor of the nose, or ranging from this mild type to the very severe one, in which we find a heavy purulent discharge, with markedly engorged membrane and turbinates, which completely block the nasal passages.

Out of 140 cases of the mild catarrhal sinus infections, 24 cleared up after the tonsils and adenoids were removed and subsequent palliative measures used, *e. g.*, suction and baking. In the past few years permission for a sinus operation along with the tonsils and adenoids was refused in 12 cases. These returned within a few months to a year with no abatement of their symptoms, and it was then necessary to open and drain the antral sinuses in order to clear them up.

There were varying degrees of severity of sinus infection with a variety of symptoms, from the entirely local sinus symptoms, as in 350 cases, to those with accompanying systemic complications, numbering 93 cases.

The following cases have been chosen to illustrate: 1. Varying degrees of nasal sinus symptoms; 2. some of the complications; 3. type of treatment; 4. varying reactions.

Case 1: Boy, E. J., age 3 years, history of repeated colds, several middle ear infections, poor appetite, anemia, maldevelopment.

Physical Examination: Ears negative. *Nose:* Thin mucus discharge adherent to the nasal mucous membrane, slight thickening and engorgement of the nasal membrane and inferior turbinates. *Throat:* Hypertrophied, diseased tonsils and adenoids. *X-ray:* Clouding of both antral sinuses, thickening of the ethmoid mucosa. *Transillumination:* Opacity of the antrae.

Operative Procedure: The tonsils and adenoids were removed in the usual manner, and after bleeding was controlled, a small trocar was introduced under the inferior turbinate, and the antral cavity was entered. The wall posteriorly was broken down by a backward movement of the instrument. A curved rasp was then introduced and the bony wall was opened up wide to freely admit a long, straight metal suction tip. The contents of the antra were removed by suction. The same procedure was followed on the other side, and the patient was turned face downward. There was free bleeding for a few moments, but no packing was necessary.

Postoperative: Patient returned after a week and the following findings were noted:

The nose was entirely clear, and the mucous membrane normal in appearance. The tonsil and adenoid region presented the usual post-operative findings.

The child was more alert, and the mother reported that the boy slept better and was able to breathe freely.

This is representative of a group of 250 cases of the very mild catarrhal form of sinusitis. One wonders that the small amount of discharge found should give both the obstructive and toxic symptoms

that it does. I have tried using simple suction, baking and argyrol tamponade with success, in only seven instances.

Case 2: Girl, S. G., age 8 years, history of repeated severe nasal colds with headaches, varying degrees of temperature, poor appetite, loss of weight, pains in the small joints of the upper and lower extremities, with limitation of motion due to the pain.

Ears negative. *Nose:* Thick mucopurulent discharge bathing the inferior turbinates and the floor of the nose. The inferior turbinates were markedly congested, and the nasal membrane was thickened. *Throat:* Diseased tonsils and adenoids. *Joints:* Slight swelling and tenderness of the small joints of the right hand. *X-ray:* Clouding of the right antrum, thickened membrane on the left. *Transillumination:* Complete opacity on right, slight on left.

Operation: Removal of the tonsils and adenoids; puncture of the antral sinuses for drainage; suction used to clean out a heavy discharge in the right antrum; no packing.

Postoperative Treatment: The child was seen again five days later. The discharge was still heavy and was cleaned out by suction, followed by baking under the infrared lamp. Ephedrin and neosilvol drops were prescribed for use at home. The response in this case was gradual and the discharge cleared up in three weeks, while the joint symptoms disappeared entirely at the end of three months.

Case 3: Boy, M. G., age 6 years, history of repeated nasal colds, persistent discharge through the anterior nares and posteriorly through the nasopharynx, causing him to vomit, especially in the mornings. There was a persistent cough for the last three months, so severe as to simulate whooping cough.

Ears: Right drum thickened, showing evidences of previous inflammation; left negative. *Nose:* Mucopurulent discharge with engorged nasal membrane and hypertrophied middle and inferior turbinates. *Throat:* Diseased tonsils and adenoids, heavy postpharyngeal discharge. *X-ray:* Clouding of both antrae, ethmoids clear. *Transillumination:* Opacity of the antrae.

Operative Procedure: Removal of tonsils and adenoids, and puncture and drainage of the antral sinuses.

Postoperative Treatment: Suction and baking with the use of ephedrin and neosilvol drops at home. The cough started to clear up within a week, lost its whooping cough characteristics and was entirely gone in three months, with the nose cleared up, and the child showing marked general improvement.

Case 4: Girl, M. G., age 6 years, history of repeated colds, persistent nasal discharge, chronic pyelitis, with acute exacerbations. The child was underdeveloped, anemic, with the pallor typical of pyelitis.

Ears negative. *Nose*: Mucopurulent discharge on the floor, with engorged mucous membrane and inferior turbinates. *Throat*: Diseased hypertrophied tonsils and adenoids. *X-ray*: Clouding of both antrae, ethmoids negative. *Transillumination*: Complete opacity on both sides.

Operative Procedure: Removal of tonsils and adenoids, puncture and drainage of the antral sinuses.

Postoperative Course: Suction and baking, followed up with ephedrin and neosilvol drops at home. This child showed improvement in a few days, and the pyelitis cleared up within four months, and development became normal.

COMMENT.

The four cases given are illustrative of different classes and different manifestations of the same condition. They range from the very mild to the very severe infection, but none were so severe as to require radical operative measures.

There have been a number of reports of suppurative infections of sinuses in children requiring radical operation. I have in mind a case of Dr. Sam Goldstein, in which he did a radical antrum operation in a child age 7 months. The child had had its right antrum opened and drained, but this was insufficient, and the entire face, forehead and neck on the involved side became swollen and edematous. Pressure over the antrum produced a flow of pus from the nose. A modified Caldwell-Luc operation was done, and the antrum was found full of pus and polypi; recovery followed.

I believe that with the education of the public, as well as the physician, of the importance of sinus infections in children, these cases will be brought to us at their incipency, and so will obviate the necessity for later radical operative procedure, with its attendant risks and complications. As a matter of fact, I have had a number of patients come to me with a diagnosis of sinusitis in their children, made from their observation of other cases. As I have previously stated, I was led to combine the two operative procedures; that is, the removal of the tonsils and adenoids and the antral drainage, because of the many cases that came back with no relief. This led me to examine the nose more closely and now, when I find that the nasal passages have even a slight amount of mucus on the floor, or that the nasal membranes or turbinates are not absolutely normal, with a history that points to the sinuses to even the slightest degree, I open and drain the antral sinuses. I consider it a perfectly harmless and absolutely justifiable procedure. One cannot judge by the amount of pathology apparent to the inspecting eye as to the length of the postoperative treatment that will be necessary. I have seen a thick purulent discharge disappear within a week, and a thin mucus

discharge persist for six months. Any one or group of the symptoms given as those of sinus infection may be aggravated and stand out as the chief symptom of that particular child's illness. I had 12 cases where permission was refused for drainage of sinuses at the time of the removal of the tonsils and adenoids, and these had to be operated at a later date. In the entire series I had no untoward results, the only complication being an occasional subcutaneous hemorrhagic effusion and edema under the eyes, but this occurred in just three instances. It is my contention that a great many of the severe, the chronic and incurable sinus involvements in adults with the disastrous end-results are directly traceable to sinusitis in childhood. The more severe forms of sinusitis, where there is a persistent nasal discharge, are usually taken care of. It is the milder cases, however, that are neglected, and when the removal of tonsils and adenoids does not give a complete cessation of symptoms, it is usually laid to a poor operative result, or a return of the adenoids. Many of these cases are operated again and again for the removal of adenoids, when the entire trouble lies in the nasal sinuses.

We must remember that this operative procedure is done when there are no acute general symptoms. I have seen an acute infection of the tonsils develop when the antrums were drained first. There are cases, of course, where the antrums are acutely infected and drainage must be instituted immediately. However, in the average case, where there are no acute symptoms, it is a perfectly safe procedure to drain the antrums at one and the same time as the removal of the tonsils and adenoids.

I want it also understood that I do not minimize the importance of a possible coincident allergic or general systemic condition. Not all diseases of children can be put at the door of the sinuses. However, the sinuses should be cleared up if the evidence points towards them. I have not mentioned the other sinuses, because I have found them involved infrequently. I wish also to stress the importance of constitutional care of the child, because any general disorder will retard the clearing up of the local condition. Not all cases were cured in three months; some took from six months to a year. Seventeen of these cases recurred, but these responded to palliative measures.

CONCLUSIONS.

1. Sinusitis is a very common occurrence in children, and may appear at birth or at any time thereafter.
2. The symptoms are those of nasal obstruction, with discharge, headaches, coughs, temperature, underdevelopment and systemic involvement, such as joints or pyelitis, etc.

3. The case showing just a small amount of mucoid discharge may be just as severe in its effect as the one with a thick purulent one.

4. In this group of 443 cases we drained the antral sinuses in all children brought in with diseased tonsils and adenoids, where either the history or physical findings pointed to a sinus involvement, whether mild or severe in character. This procedure is a perfectly safe one, and has given no untoward results. Instead of subjecting the child to another operative procedure, with its attendant risks, both operations were done at the same time.

5. Constitutional treatment is very important. One should also remember coincident allergic or other conditions which with the sinuses give the symptoms of the disease.

STATISTICAL RESUME.

	No.	Type Discharge	Duration Treatment	Results
Catarrhal	277	Thin to heavy mucus	One week to six months	Cured
Purulent	166	Thin to heavy purulent	One week to six months	Cured

Constitutional Complications—Treated in Conjunction with the Sinuses.

	No.	Type	Results
Pyelitis	36	15 to 50 cells to field	Cleared up in 2 to 3 months
	Female 30		
	Male 6		
Joint	7	Painful tender joints — no anatomical changes	Cleared up in 4 to 6 months
Cardiac	39	Mitral regurgitation. 29 Mitral stenosis, 5 Double, 5	No cardiac change—general improvement
Coughs	12	Hacking irritative	Cleared up in 1 to 4 months

Operative Complications.

Subcutaneous hemorrhagic effusion under eyes	Hemorrhage	Fever
3	None	All have some reaction. Lasts a few days.

Bacteriology—Cultured in 37 cases.

Staphylococcus aureus and albus.

Streptococcus and bacillus Friedlander.

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225 East 19th Street.

RETROPHARYNGEAL ABSCESS COMPLICATING A MASTOIDITIS IN AN ADULT.*

DR. ARTHUR G. BEYER, Cincinnati.

J. T., a male, traveling salesman, age 44 years, came to my office, Feb. 25, 1930, with an acute right mastoiditis. The onset had begun two weeks previously with the symptoms of an ordinary purulent otitis media following a cold of three weeks duration. He complained of pain in the right ear, extending down the right side of the neck, and an inability to sleep at night for the past week, even when the pain subsided. He had been away from home and had been treated by several doctors along his route without relief or advice as to the possible seriousness of the disease. No myringotomy had been done.

His past history revealed only that he had an attack of acute rheumatic fever at the age of 12 years, tonsils removed ten years ago, and has been subject to two or three colds each winter. No previous ear trouble had been experienced.

Examination: Temperature, 99.4°; pulse, 100. The tissues over the right postauricular space were inflamed and very tender, and the neck was held rigid on account of the pain in the right sternocleidomastoideus muscle. There was a free discharge of pus under pressure through a large central perforation. The external canal was narrow and the posterior superior canal wall was decidedly lowered.

The nasal mucosa was subacutely inflamed, no pus was seen in the nose, and there was free bilateral breathing space.

The teeth and gums were excellent and very little dentistry had been done. Two large tonsil stumps were present, not inflamed but contained much cheesy material. A mild lateral pharyngitis was present on both sides.

The left external auditory canal was large, the drum was intact, not retracted, and the landmarks were normal.

X-ray showed the mastoids to be of the pneumatic type and very extensive; the right was cloudy with indistinct trabeculae. The nasal sinuses were unusually large but had no abnormal densities.

*Read before Meeting of the Cincinnati Otolaryngological Society., Nov., 1930.

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The patient was sent to the Good Samaritan Hospital and two days later a simple mastoidectomy was done. The mastoiditis was of the typical coalescent type, with pus and granulations. The cavity was very wide and deep. The trabeculae were soft, but the inner plate was firm and there were no exposures.

He was dismissed from the hospital one week after the operation, and in five weeks the posterior wound was closed, the ear dry, Eustachian tube patent and the hearing good; with no pain or fever. The condition remained satisfactory for a short time. On April 18 he complained of severe pain over the entire head, the temperature was 97.8° , the drum was not inflamed. A few days later there was a slight discharge through the drum associated with a dull pain in the right eye and in the right occipital region. A myringotomy was done but the pain and discharge increased. On May 13 the posterior wound was inflamed. The pain was especially severe at night. The wound was opened and about 5 c.c. of pus escaped.

The symptoms diminished, disappearing entirely for a few days, and returned with gradually increasing severity until July 22, when a secondary mastoid operation was done. There was a small amount of pus in the center of the cavity. The aditus was closed with granulations, which were removed and the opening enlarged until the attic could be entered freely. In search for retained pus the sinus was exposed from above the knee to the bulb, and the deep region between the sinus and facial ridge was especially explored for cells or fistulae, but nothing causing retention was uncovered.

The pain in the right eye diminished for a short while, but by Aug. 12 it had become intermittently very severe, especially at night, and the neck was becoming stiff again. A radical mastoidectomy was done Aug. 21 in an attempt to find a sequestrum, probably from the pyramid, or retention in the attic. Nothing was discovered excepting some exceptionally large tubal cells, which contained pus.

The symptoms again subsided for about ten days and then an afternoon fever, ranging from 99.5° to 100° , pain in the right eye, headache and stiffness of the neck returned. For the first time a slight bulging of the right posterior pharyngeal wall was observed. On Sept. 9 the temperature was 101° , swallowing was slightly difficult and considerable discharge was escaping through the ear from the Eustachian tube. There was no fluctuation. On Oct. 7, however, deep fluctuation could be felt through the right pharyngeal wall. The temperature was 101° and the discharge from the ear was profuse. The retropharyngeal abscess was incised and about 10-15 c.c. of thick pus was discharged under pressure. Through and

through irrigation was tried a few days later but could not be accomplished with gentle pressure. In one week the discharge both from the ear and pharynx had completely disappeared and with it the pain in the eye, headache, stiffness of the neck and fever.

I have omitted the reports of all general and special examinations because they threw no light upon the condition. The ocular muscles, fields and fundi, blood and neurological examinations revealed nothing excepting a moderate anemia and leukocytosis. The bacteriological examinations were disappointing, the Good Samaritan laboratory returning reports of no definite organisms on three occasions.

Very few pharyngeal abscesses secondary or concomitant with mastoiditis have been reported. I believe this abscess originated in the tubal cells and descended from the apex of the petrous bone into the posterior pharyngeal space and through and through drainage was established by incision of the pharyngeal wall because with this incision the discharge from the tube immediately became very slight, and discontinued entirely in one week. The most constant and prominent symptoms were deep pain in the right eye and in the right occiput and were always most severe at night.

Dr. Dan McKenzie has written an illuminating paper on this subject and reports two similar cases in his experience. I am certain the complication is not as rare as our sparse literature on the subject leads one to believe.

702 Doctors Building.

TREATMENT OF EAR CONDITIONS THROUGH THE EUSTACHIAN TUBES, WITH CONSIDERATION OF INDICATIONS AND DIFFICULTIES.*

DR. M. VALENTINE MILLER, Philadelphia.

There are many cases of ear disorders which are wholly, or in part, the direct result of obstruction in the Eustachian tube. Many of these cases may be very greatly benefited by intratubal treatments. These are most satisfactorily carried out by the use of the Yankauer applicators, wound with cotton. These serve a twofold purpose, the cotton-wound applicator carries medication directly to the mucosa lining the tube and at the same time, through the pressure on the walls, causes dilatation of the tube. The advantages of this method of treatment as compared with simple inflation are many and are obvious. The dangers in the hands of a careful and competent operator are negligible.

This treatment was first described by Yankauer in July, 1910 (THE LARYNGOSCOPE). For some cause it has not gained widespread use. Many have not heard of it and others who have heard do not use it because of certain ill-founded objections, which we will discuss later. The treatment has been in routine use in the clinic of Dr. George M. Coates in the Graduate School of Medicine of the U. of P. for at least nine years. I have used it in my private practice for almost as long. Our results in the clinic and mine in my private work have been, in many cases, such as we could never have hoped for under any other form of treatment. It is quite common for patients, after they have once had the treatment, to ask for it the next time they appear because of the improvement they have had.

Instruments Used: The applicator is a narrow gauge steel wire which is bent in the center and the two ends twisted together in their entire length until the resulting instrument is a wire applicator, about $9\frac{1}{2}$ inches long, with a small loop at one end and small enough to allow of passage through the Eustachian tube even when wound with a small amount of cotton. This applicator must be used with a special handle. This is a hollow tube, $9\frac{1}{2}$ c.m. long, with a set screw at one end. Starting at approximately the middle of the tube, there are markings running up toward the screw. There are first two divi-

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sions, each of which is 10 m.m. in length, then there is one division of 5 m.m. and after that six of 2 m.m. each, making a total of 37 m.m. of measured distance. This 37 m.m. corresponds to the average length of the Eustachian tube, the first three marks totaling 25 m.m. comprising the length of the cartilaginous portion, and the remaining 12 m.m. making up the length of the bony portion.

An Eustachian catheter is selected, a No. 2 is usually the best and its bore must be large. After inserting the applicator into the handle the two are inserted into the catheter. The handle is pushed in until the beginning of the first mark is on a line with the mouth of the catheter. It is held in this position while the applicator is passed in through the handle until the loop is on a level with the distal end of the catheter. When this point is reached the screw is set, holding the applicator in place. It will now be seen that when the applicator and handle are pushed into the catheter until the last of the 2 m.m. marks has just disappeared, we will have just 37 m.m. of applicator protruding from the distal end of the catheter, or enough to lie in contact with the entire length of the Eustachian tube.

After this has been attended to, a bit of long fibre cotton is taken and pulled out into a very thin sheet, about 2 inches long and about 1 inch or less broad. This is laid on the fingers of the left hand, the applicator taken out of the catheter and the loop end laid on the cotton at the one side. The applicator is then rotated, winding the cotton evenly about the wire. It must be wound on very firmly and the cotton which may be extending beyond the loop is cut off and the applicator is ready for use. The cotton is saturated with a 4 per cent or 10 per cent solution of cocain or, as I prefer, a 3 per cent solution of ephedrin hydrochlorid. The latter has, to my mind, several advantages over the cocain: the shrinking action is of longer duration and it does not anesthetize. Anesthetizing of the tube as you insert the applicator may be well in nervous and excitable patients, but until an operator has acquired considerable experience it may prove a snare and he will find himself using so much force in the attempt to overcome an obstruction that he will do considerable damage to the lining mucosa. If the operator is gentle there is very little pain complained of even when no anesthetic is used.

A word here regarding the insertion of the catheter. When there is no obstruction of the nasal passages this is easily accomplished. The operator first blows air through the catheter to make sure it contains no water or debris which might be forced into the Eustachian tube. Next he assures himself that the nasal passages are free of any acute inflammation and there is no free secretion lying in the floor of the nose. A cotton-tipped applicator is then wiped over the

Eustachian orifice to remove any secretion which might lie there and then this area is brushed with a little 4 per cent cocain solution. This latter, I feel, is good practice as when it is done there is far less probability of the irritation of the catheter causing a contraction of the pharyngeal muscles and interfering with its insertion into the orifice. There are some patients whose tubes cannot be catheterized without this cocainization. The point of the catheter is inserted in the nose and passed backward, raising the proximal end as this is done. When the catheter has dropped over the soft palate it is rotated inward until it is felt to catch on the posterior edge of the septum; it is then rotated outward and will usually slide directly into the Eustachian orifice. This is the way catheterization is usually taught, but I find it easier to pass the catheter back until it is in contact with the posterior pharyngeal wall, rotate it outward (at which time the point will be lying in the fossa of Rosenmüller), then pull it forward over the salpingopharyngeal fold, when it will fall into the orifice very readily.

Before inserting the catheter it is necessary to make a complete examination of the nose. In the event of any acute or chronic infection being present catheterization should be postponed until this is cleared up. If there are any anatomic irregularities these must be studied so as to know and recognize the easiest way to insert the catheter. The most common obstacles to ready insertion are: septal deflections; septal spurs and ridges; hypertrophied turbinates or turbinates which project toward the septum rather than lying in their normal position nearer the lateral nasal walls; nasal and postnasal polyps and large adenoid masses. At times bands of adhesions about the Eustachian orifice may cause difficulty. Occasionally, too, synechia are found between a turbinate and the septum. All of these anatomical obstructions should be corrected if it is hoped to correct hearing defects due to Eustachian tube congestion. Infraction of the inferior turbinates laterally may give room enough to pass the catheter freely. Polyps should, of course, be removed and the cause of their forming attacked and cleared up before intratubal treatment is instituted. Bands of adhesions in the nasopharynx should be broken up by a sweep of the finger end through that area. Synechia should be divided and care taken to prevent their reforming.

Frequently septal spurs or ridges can be passed by introducing the point of the catheter under the obstruction and toward the septum, keeping the proximal end of the catheter fairly well below the floor of the nose and toward or beyond the septal line, passing the catheter in until the obstruction prevents further progress, then turning the point outward under the inferior turbinate, at the same time slowly

inserting it and making a fairly large sweep with the proximal end through an arc downward, outward and inward until the point slips into the nasopharynx. At times a spur will be in such a position that the point of the catheter can be inserted over it until it passes the obstruction, then when the bend of the catheter is over it the catheter is rotated so that the flat of the bend is parallel with the floor of the nose and the proximal end just beyond the septal line, at which time it will fall to the floor and be brought back to its normal position and passed on in.

Sometimes the catheter may be in proper position and yet no air can be made to enter the tube. This may be due to a stenosis but is far more likely to be caused by a fold of mucous membrane which has been caused by pressure of the end of the catheter. Carrying the outer end of the catheter laterally a short way may allow this fold to smooth out. If this does not do it the catheter should be removed and the curve altered so that it will fit. It may be that simply rotating the tip upward slightly will be sufficient. When in the proper position the ring on the proximal end of the catheter should point toward the outer canthus of the eye. All of these little matters of technique vary with each individual case and it requires practice, and a great deal of it, to know what is the best for each case. There are cases where the catheter must be passed through the opposite side of the nose in order to catheterize certain tubes. This can usually be done with little difficulty if the bend of the catheter is slightly increased. If patients will consent to having submucous resection, turbinectomy or removal of spur or ridge, many of the difficulties attending catheterization will disappear, but we all have had patients who will not consent to any surgery and we have to proceed as best we may under existing conditions.

Irritability of the soft palate and the pharyngeal muscles may often cause difficulty because of spasm of these muscles as soon as the catheter touches this area. This may be easily and safely prevented, or at least greatly reduced, by brushing the area with a cocaine or butyn solution. I am aware that there are some who object to this but I can see many advantages and no harm, unless there is a drug idiosyncrasy. I do it routinely in my office and in the clinics and do not recall one case where there were untoward results or any case in which I was unable to pass the catheter because of muscular irritability. By doing this I have been able to give routine Yankauer treatments to children as young as seven with no difficulty and with great benefit to the patient.

To return now to the use of the Yankauer applicator: The catheter is inserted into the Eustachian orifice and the operator makes sure it

is in the proper place by blowing a gentle blast of air through it, using a diagnostic tube so that he can hear the air as it enters the tube. This is important as, in addition to verifying the fact that the catheter is properly placed, it tells the trained ear something of the patency of the tube. If the tube is fairly well open the air will pass through with a sound of a thud as it hits the drum, followed by a "swish" as the air passes through the tube. Politzer says "this sound can be compared to that produced by placing the tongue against the hard palate, and quickly performing an act of expiration with the lips slightly apart." If the patient is told to swallow as the air is forced in, the air will pass more freely. The pitch and intensity of the sound will vary with the calibre of the catheter, the size of the tube and the position of the tip of the catheter in regard to the walls of the tube. If the tube is narrowed by a swelling of the mucosa, without secretion, there is a rather high-pitched blowing sound. If there is moisture there are rales of various types heard, depending upon the character of the secretion. The inflation is best done with a Politzer bag, grasping it on the sides and squeezing it from that direction. If it is grasped, as I have so often seen it, in the palm of the hand, there is a decided tendency to, when squeezing it, force it against the catheter, thereby causing the patient unnecessary pain and at the same time possibly dislodging it. Gentle pressure only should be used. Compressed air from a tank or pump may be used, but with extreme care, as I have twice seen too much pressure used in this way and the tympanum ruptured.

After the catheter is in the proper position it is held there by the thumb and first two fingers of the left hand, while the other two fingers rest on the patient's nose to prevent slipping. The Yankauer applicator, the cotton having been medicated, is then inserted into the catheter. It is passed in until the beginning of the first mark on the handle is level with the end of the catheter. Here we know that the tip of the applicator is about to enter the Eustachian tube. It is passed on in and will usually pass until the first two marks, and possibly the third, have disappeared. At this point we know we are at the isthmus, and it is here that we usually encounter the most obstruction. It is well to remember here that the height of the isthmus is just twice the breadth, and consequently if, when we encounter obstruction, we rotate the applicator through 90 degrees we may get the flat of the loop on the end of the applicator in the long diameter of the isthmus and it will more readily pass through. If this is done and the applicator still does not pass, it is held there with gentle pressure until the lining mucosa is shrunk sufficiently for it to go forward. It is then inserted until the last mark has just disappeared

into the catheter. The applicator is allowed to remain in place for 15 minutes to a half-hour or longer, depending upon the case and the amount of time the operator can allow for the patient. It is then withdrawn and saturated with a 1 per cent solution of tr. iodine in glycerin, argyrol, weak silver nitrate, or whatever medication it is desired to carry into the tube. It is allowed to remain in position but not necessarily as long this time as before.

Occasionally one will find that, although the air has passed freely through the catheter and into the tube, the applicator will encounter an obstruction as soon as it emerges from the catheter. This may be due to the catheter having too much or too little bend and the applicator, on emerging, strikes the wall of the tube or forces a fold of mucosa ahead of it. Correction of the bend will overcome this difficulty. More often, however, the obstruction is due to a slight fold of mucosa produced just ahead of the catheter and caused by it. In this case gentle rotation upward of the tip will lift the point of the applicator over the fold and allow it to pass in.

After the dilatation it is often of benefit to allow heated medicated air to be blown through the catheter. There is a very satisfactory air heater on the market and Dr. Geo. M. Coates has devised a metal chamber to contain the medicated powder, and which can be attached to the end of the heater. A good preparation for use in this chamber is: \mathcal{R} iodine crystals; menthol crystals, aa gr. 5; sodium bicarbonate; talc, aa \mathfrak{z} ss. A small amount of this is put in the chamber between loose layers of cotton and the warm air blown through it.

Patients should always be warned against blowing the nose for some time after these treatments as, with the tube wide open, there is danger of forcing some secretion into the middle ear. The treatment may be repeated at intervals of three days at first, gradually lengthening the periods between treatments as the condition responds. One treatment now and then will have no permanent effect and the patient must be warned at the outset that, if he hopes for results, he must make up his mind to return for treatments regularly. Results can best be checked by the use of the audiometer, whose readings will give a graphic representation of the condition and the variations from treatment to treatment.

The cleaning of the applicators after use is extremely important. They should be laid down on a flat, hard surface and the cotton scraped off with a sharp knife, without using much pressure. The applicator should be rotated as it is scraped and care taken to keep it flat so as not to produce a curl. *The cotton should never be burned off* as this makes the wire extremely brittle and there is danger of its breaking off in the tube. After cleaning the applicator is boiled

and dried. If properly taken care of these instruments will last for many treatments.

Bougies are used by some for dilating the tube, but in my experience they are not as successful and the results are not as good as those obtained by the applicators. In the first place, the bougies are made and marked for use only with the short Yankauer catheters and when used with the longer instruments they must somehow be remarked. In the second place, they are too flexible and it is difficult to insert them into a tube when any pressure must be exerted. In addition, when they are used pressure only is exerted and no medication can be carried in with them. As over against these disadvantages of the bougies, the applicators are firm enough to exert considerable pressure; they may be adjusted in handles so as to fit any catheter; the amount of pressure exerted on the lining mucosa may be varied by the amount of cotton wound on the wire, and medication may be carried directly into the tube.

Before entering upon a course of treatment, it is important to correct any anatomical or pathological condition which may be an etiological factor in the production of the condition. Hypertrophied and diseased tonsils and adenoids should be removed; adhesions about the Eustachian orifice broken up; any sinus involvement should be cleared up and any abnormal conditions of the septum and turbinates attended to.

Treatment with the Eustachian applicators is indicated in the following types of cases:

1. Deafness and tinnitus due wholly or in part to varying degrees of occlusion of the Eustachian tube.
2. Tinnitus alone, due to a slight tubal congestion and without any noticeable deafness.
3. For the relief of a "feeling of fullness" in the ears. This may accompany a deafness of any type but may appear alone.
4. Deafness in children.

This last class of cases, I feel, it would be well to emphasize. There are a great many children who develop a deafness due to tubal congestion produced by repeated colds, and which progresses without treatment until in later life there is deafness developed sufficiently to be a decided handicap. These cases develop insidiously and, when the child does not respond quickly when spoken to, the parents blame it on "inattention" and give no thought to the possibility of a developing deafness. I feel that we should urge parents to have their children's hearing tested from time to time, particularly after repeated colds, sinus infections and middle ear involvement, allowing, of course, sufficient time to elapse between the subsidence of the

infection and the test for the tissues to return as nearly to normal as they may. It is amazing how often one finds a degree of deafness present, unsuspected by the parents. The results of treatment in these cases are very striking and the vast majority can be brought back to normal. I keep records of every hearing test made with the audiometer and tuning forks and can watch the progress of the case. These help in determining the frequency and length of treatment. I use the Yankauer applicators freely in children as young as 7 years of age. One recent author states that he has never passed an Eustachian catheter upon a patient less than 16 years of age, and does not make a practice of doing it at any age. I can see no reason for hesitancy in using the catheter and I believe that catheterization is just as safe, and probably safer, than inflation with the Politzer bag and olive tip. The pressure of the air can be more carefully guarded and the force of it is applied to the Eustachian tube and middle ear alone.

There are certain objections raised to the Yankauer treatment. I feel, however, that these arise from inexperience or from faulty technique. One point brought up is the possibility of carrying infection into the middle ear. In the nine years during which time I have used this treatment in my private practice and in the clinics, I have not seen a single case of infection follow its proper use. If the following precautions are taken the danger of infection is negligible: Never attempt the treatment in the presence of an active nasal or pharyngeal infection, or within a week or ten days following; be sure that the nasal passages are free of secretion and that the Eustachian orifice is wiped clean before catheterization and inflation; be sure that there is no fluid or debris in the catheter before it is inserted; follow the dilatation by application of iodine and glycerin, argyrol or silver nitrate, as these, in addition to their effect upon the lining mucosa, tend to inhibit bacterial growth; warn the patient about blowing the nose too soon after catheterization.

The possibility of injury to the internal carotid artery has been suggested. It is true that as the artery makes the bend in the petrous portion of the temporal bone, it is in close relation to the Eustachian tube, but I have found no record of such a complication and have found nobody who had any knowledge of a case. I doubt whether it could happen. The applicator is blunt and wound with cotton and could only strike a glancing blow. The instrument would be inserted into the tube slowly and if dangerously near the artery a careful operator would feel the pulsation transmitted through the applicator.

The breaking off of the applicator in the tube or the coming off of the cotton are other possibilities employed as arguments against its

use. If properly applied, the cotton cannot possibly come off unless scraped by a knife. If the applicators are properly cared for and carefully inspected before use, it is almost impossible for them to break. Only once in my experience have I had an applicator break in the tube. Very fortunately the broken portion was withdrawn with the main part, as they were held together by the long fibre cotton which had been used in wrapping it. I found out afterward that that particular applicator had been cleaned of cotton by passing it through a flame.

Some raise the objection that the lining mucosa may be injured by the intratubal manipulation, and that stenosis may result. It is conceivable that, in the hands of a careless operator, considerable injury could be done, but if the operator is careful and conscientious in his work this will not occur. If abrasions do occur and treatments are given as often as they should be, there is no chance of cicatricial contraction blocking the tube and in the end the mucosa will probably be drawn more tightly to the walls of the tube than it would without the abrasion.

Emphysema is mentioned as another complication. There is no more—and probably not as much—likelihood of this complication developing in the tube than there is of its developing in the nasopharynx on ordinary catheterization and inflation. Proper technique makes the occurrence improbable.

My conclusions, after having given the treatment some thousands of times during the past nine years, are:

1. The use of the Eustachian applicators in cases of Eustachian tube congestion is safe, logical and beneficial and can be used even in young children.

2. Many cases of obstructive deafness and tinnitus can be cleared up by this method when no other treatment would have any beneficial effect.

114 W. Phil-Ellena Street.

PORK BONE IN BRONCHUS CAUSING SYMPTOMS SIMULATING PULMONARY TUBERCULOSIS.

DR. CHARLES D. SNELLER, Peoria, Ill.

Case History: Five months before admission, a female patient, age 43 years, choked while swallowing some meat. For nearly two weeks she coughed frequently and expectorated rather thick sputum, very much streaked with blood. Gradually, as time went on, the expectoration became thicker, with no blood, some loss of appetite, some weakness and loss of weight, and a low-grade afternoon temperature. The only chest symptom was a burning sensation, more in the right than the left chest.

Examination On Admission: X-ray demonstrated a lagging of the diaphragm on the right side, a definite increase in the density of the region below the right hilus and a moderate degree of obstructive atelectasis. No foreign body was apparent. On auscultation, an asthmatic wheeze was most increased anteriorly, axillary and posteriorly over the site of the right lower bronchus.

A *diagnosis* of foreign body in the right lower bronchus was positively made. During the five months before admission, the presence of a foreign body was unsuspected; in fact, the diagnosis pointed toward pulmonary tuberculosis.

A *bronchoscopy* was done without anesthesia. A piece of pork bone, 2x8x15 m.m., with two sharp points and one knife-like edge, was successfully removed in about one minute. The patient made a rapid and a total, uneventful recovery.

DISCUSSION.

Foreign bodies which do not completely obstruct a bronchus, and which are only slightly irritating to the bronchial mucosa, do not cause immediate symptomatology. In fact, more than 300 cases are recorded in the literature in which a foreign body has been overlooked for a period of weeks and even for as long as 36 years before sufficient symptoms had developed to cause the patients to require medical attention.

Memory of most patients regarding mild symptoms of onset is usually very poor in many pathological conditions. This is particularly true if no pain or alarming symptoms had occurred. Therefore, history may be useless as an aid in diagnosis.

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At the present time the careful study of Roentgenograms, in the presence of radio-translucent foreign bodies, is our best aid in diagnosis. Of course, physical findings are necessarily essential. Radio-opaque foreign bodies are easily diagnosed. An obstructive atelectasis is produced and followed, depending upon the duration and extent of bronchial obstruction, the resistance of the patient and the type of invading organism, by bronchiectasis, lung abscess, etc., *i. e.* pulmonary sepsis.

A sufficient absorption of bacterial toxins from any source, but particularly from the lung, will bring about a secondary anemia, loss of appetite, loss of weight and strength.

These so-called typical symptoms of pulmonary tuberculosis may develop, but always the sputum is negative to the tubercle bacilli. The Roentgenograms will frequently reveal startling findings in some of these cases, but there is an absence of apical involvement. All such cases should positively require ruling out a bronchial foreign body. From large tuberculosis sanitariums cases have been reported in which removal of the offending foreign body has cured the patient of the simulating pulmonary tuberculosis.

In the case reported in this paper, the expectoration of sputum streaked with bright red blood, the gradual loss of weight, strength, appetite, etc., during the subsequent five months might easily have been diagnosed early pulmonary tuberculosis. The obstructive atelectasis, absence of apical signs, the localized asthmatoïd wheeze, etc., were diagnostic. The total and rapid recovery of the patient, after bronchoscopic removal of the pork bone, is the final proof of the correctness of the etiology.

SUMMARY.

No more fitting summary of our present knowledge of overlooked bronchial foreign bodies and of those which may cause symptoms simulating pulmonary tuberculosis, can be found than the following lines from our Chevalier Jackson:

"One of the most striking things in these overlooked cases is the inevitable conclusion that countless thousands of patients with lung suppuration have, in past years, been buried without the foreign body origin ever having been suspected and the further conclusion that *many of the cases were supposed to have died with pulmonary tuberculosis.*"

319 Jefferson Building.

NONSPECIFIC PROTEIN THERAPY IN NOSE, THROAT AND EAR AFFECTIONS.*

DR. JOSEPH C. BECK, Chicago.

In presenting this paper before the Academy I determined upon these three definite courses:

1. That I would be very sympathetic to the subject of protein therapy, knowing full well that the future of serology and immunology in all its possibilities is destined to play a great role in medicine.

2. That since the application of protein therapy was general or systemic, rather than local, and since this systemic condition, whether toxic or septic, was usually due to some local pathological process, I would be insistent first upon surgical removal of such local pathology and not treat it by any other method. This, of course, must be qualified by the possibility of contraindication to any kind of operation, or where specific medical treatment is indicated.

3. That I would avoid, as much as possible, repetition of well known facts, thus relieving the already overburdened literature on this subject.

FOREIGN PROTEIN THERAPY DIVIDES ITSELF INTO TWO GREAT HEADINGS.

1. The theoretical and research. 2. The practical or clinical application.

It is the latter, the clinical, that I shall practically limit myself to and only sketch for you the progress that has been made along the theoretical and research part of the work, depending upon the gentlemen that have favored me with their willingness to discuss my paper, to further elaborate upon that side of the subject. The following literature which I have reviewed will give the necessary information on the subject of nonspecific and foreign protein therapy in general:

AUTHORS OF NONSPECIFIC PROTEIN THERAPY IN GENERAL.

1. HOFF, F.: Non-Specific Therapy. Monograph, 1930.
2. KOENIGER: Non-Specific Protein Therapy. Text, 1929.
3. MILLER, J.: The Present Status of Non-Specific Therapy. *Jour. A. M. A.*, Aug., 1930.
4. PETERSON, W.: Protein Therapy and Non-Specific Resistance. 1922.
5. PETERSON and WEICHARDT: Protein Therapy and Non-Specific Resistance. German Text, 1923.

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6. STEJSKAL: Newer Therapeutic Methods, Including Non-Specific Protein Therapy, 1924.

7. WEICHARDT, W.: Non-Specific Protein Therapy as a Means of Increasing Healing Processes. *Ergebnis d. Hygiene, Bakter., Immunitätsforsch u. Exp. Therapie*, Vol. 5, 525, 1922.

8. WOLFF, L. H.: Non-Specific Therapy. *Ztschr. Exp. Med.*, Vol. 67, 5683, 1929.

9. WRIGHT, SIR A., cited by WOLFF: *Ztschr. Exp. Med.*, Vol. 67, 1929.

Peterson⁴, who published the monograph on nonspecific therapy in 1922, is constantly quoted in every article on this subject, and I have made use of that book and several later publications of his in order to be informed.

It was Wright, in 1912, who brought out his opsonic index, and the specific vaccine therapy, which was followed by a very enthusiastic response in its application and the literature was immediately swarmed with articles on this subject. However, in 1923, he changed his viewpoint and accepted that much of the specificity of bacteria product was really active on nonspecific basis and gave it the term, "Epiphylaxis." This latter fact remained unmentioned by the German writers until Wolff⁸ brought it out very forcibly.

Recently an article appeared from the pen of Dr. Joseph Miller² in the *Journal of the American Medical Association* entitled, "The Present Status of Non-Specific Therapy," and in his introductory remarks he refers to a personal conversation with a surgeon which took place about twenty years ago, concerning specific vaccine therapy and its shortcomings. I would also like to refer to that time, when I presented to this Society a paper on "Wright's Opsonic Index and Specific Vaccine Therapy in Chronic Suppuration of the Nasal Accessory Sinuses and Middle Ears." It was a negative report as far as cures were concerned and most of these cases were later operated upon. Since then much better indication for vaccine or protein therapy has been established, as well as better technique in its application. Permit me now to refer you to the literature on this topic from the standpoint of the otolaryngologist, the reading of which I have found most interesting, and reference will be made to it during the course of the paper.

AUTHORS OF NONSPECIFIC PROTEIN THERAPY IN EAR, NOSE AND THROAT.

10. ALEXANDER, G.: The Employment of Milk Injection in Diseases of the Ear. *Monatschr. f. Ohrenheilk. u. Laryngol. u. Rhinol.*, Vol. 51, 1917.

11. CHAROUSEK: Discussion of Paper of Keil and Kobrak. *Ztschr. f. Hals, Nasen u. Ohrenheilk.*, Bd. 10, 50, 1924.

12. GOMPERZ: Milk Injection in Ear Diseases of Children. *Wien. Med. Woch.*, 1917.

13. GRANDE, C.: Non-Specific Protein Therapy in Otorhinolaryngology. *Val-salva*, Milano, Vol. 1, 1925.

14. IMHOFFER: Experiences with Parenteral Milk Injection in Acute Middle Ear Diseases. *Ztsch. f. Ohren., u. f. Krank. d. Luftwege*, Bd. 77.

15. KEIL: On the Use of Omnadin in Ear, Nose and Throat Therapy. *Ztschr. f. Hals, Nasen u. Ohrenheilk.*, Bd. 10, S. 35, 1924.
16. KNICK, A.: General Therapy. *Handbuch Denker-Kahler*, Bd. 6, p. 1174.
17. KNICK, A.: Discussion of Keil and Kobrak Paper. *Ztschr. f. Hals, Nasen u. Ohrenheilk.*, Bd. 10, S. 49, 1924.
18. KNICK, A.: Spinal Injury Following Injection of Vuzin by Lumbar Route. *Ztschr. f. Hals, Nasen u. Ohrenheilk.*, Bd. 10, S. 249, 1924.
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26. SHAHEEN, H. B.: Treatment of Chronic Suppurative Otitis Media by Subcutaneous or Intra-Muscular Injection of Boiled Milk. *Jour. Laryngol. and Otol.*, Vol. 44, Jan., 1929.
27. SHAHEEN, H. B.: Treatment of Middle Ear Suppuration. *Brit. Med. Jour.*, Vol. 1, 1929.
28. STERNBURG, H.: Protein Therapy in Chronic Eczema of External Ear. *Ztschr. f. Hals, Nasen u. Ohrenheilk.*, Vol. 17, Jan., 1927.
29. Voss: Discussion of Keil and Kobrak's Paper. *Ztschr. f. Hals, Nasen u. Ohrenheilk.*, Bd. 10, S. 49, 1924.

Foreign protein therapy does not mean that only a foreign protein substance, such as the following substances, must be introduced into the system *per se*, for it is the belief today that as a result of even specific sera or chemicals, such as neosalvarsan, mercury, quinin, etc., foreign protein develops in the system and through them specific antibodies develop, which in turn destroy bacteria, protozoa, or neutralize the toxemia, thus curing the disease. Certain definite reactions are expected to result when a foreign protein is introduced into the system or when it develops as a result of the introduction of bacteria, chemicals, or even physical agents, such as radiation, X-ray, radium, quartz light, etc.

PREPARATIONS USED IN NONSPECIFIC PROTEIN THERAPY.

Milk, milk preparations and other substances. 1. Aolan. 2. Caseosan. 3. Novoprotin. 4. Phlogetan. 5. Terpichin. 6. Omnadin. 7. Caseal. 8. Lactosan. 9. Yatren. 10. Yatren-Casein. 11. Strepto-Yatren. 12. Stomasin of Centanni. 13. Alfamol (vegetable protein). 14. Cutivaccine (Rethi). 15. Tuberculin. 16. Typhoid Bacilli.

Ferdinand Hoff¹ in his monograph, which deals with this subject most scientifically and interestingly as regards these definite reactions, shows a table that, while it refers to reactions of infections of short duration, is found applicable in most instances where foreign protein is acting on the body. It is divided into two phases.

HOFF'S TABLE OF REACTIONS.

Phase 1.

1. Rise in temperature.
2. Leukocytosis (myelocytic).
3. Decrease in alkali reserve (acidosis).
4. Increase in basal metabolism.
5. Increase albumosis.
6. Increase blood sugar.
7. Decrease of cholesterol in the blood.
8. Hyperactive sympathetic nervous system.
9. Increase in thrombocytes (blood platelets) and their destruction.

Phase 2.

1. Drop in temperature.
2. Drop in leukocytosis with a tendency to a lymphocytosis.
3. Increase in alkali reserve.
4. Minus basal metabolism.
5. Less albumosis in the blood.
6. Decrease blood sugar.
7. Increase in the quantity of cholesterol.
8. Hyperactivity of the parasympathetic nervous system.
9. Thrombocytes return to their normal proportions.

Phase 1 is determined one-half-hour after injection. Phase 2 is determined 2 hours after injection.

While the nine points of the table are all important when employing foreign protein injections, I have found that only some are very essential, as well as practical as a routine, whereas others are more technical and employed as checking the other routine tests, so that Nos. 1, 2, 8 and 9 are employed at regular intervals, whereas No. 4 should be determined at the beginning and within two weeks. The other tests, which are all based on blood chemistry, should be done at the beginning and at such times when these other tests would indicate some sharp changes. At a glance one might consider this an unwieldy method of treatment; however, as practice shows, it is not the case.

Locally, at the site of injection, we may have considerable swelling, especially in cases of certain bacterial vaccines, such as pyocyanous. However, in the majority of substances that are employed, very little reaction is found at the point of injection.

I have not seen marked reaction locally at the site of the chronic pathologic lesion, which is reported by some writers.

Alexander¹⁰ speaks of a case of mastoid disease, wherein he employed a foreign protein therapy that caused such a reaction and destruction of the mastoid as could not have occurred from the disease itself, and it was the occasion of his being compelled to operate much earlier than he wanted to. It is true that he employed foreign protein therapy in acute cases, whereas we have only employed it in early chronic and chronic cases. Keil¹⁵, who quotes "Much" in the use of omnadin in acute cases of infection, states that no such complication, or, for that matter, any evidence of anaphylactic shock are ever observed from its use. Rethi's²⁶ article on the use of cutivaccine, which is composed of a combination of tuberculinum Weleminsky, an albumin group substance of the tubercle

bacillus group, and cowpox vaccine toxin, in a fair number of hyper-esthetic rhinosinusitis cases with actual curative results has found a great reaction within the nose for a brief period of time, say within a week, when said reaction disappeared and patient remained free from sneezing, discharge and nasal obstruction.

Omnadin in our practice was used in a very limited number of cases, with as yet no creditable results. We cannot make any claim fairly one way or the other until greater use has been made of it.

As to cutivaccine, efforts have been made to obtain it in this country, but as yet unsuccessfully.

The various pathologic processes about the nose, throat and ear in which we have employed foreign protein therapy, and, of course, that includes all the cases of earlier times when we used autogenous vaccines, are the following:

1. Otitis externa. *A.* Eczematoid. *B.* Follicular or furunculosis.
4. Chronic sinusitis. *A.* Nonsuppurative. *B.* Suppurative.
3. Postoperative mastoid disease, both after simple and radical mastoid.
4. Chronic sinusitis. *A.* Nonsuppurative. *B.* Supportive.
5. Postoperative sinusitis, both after simple or conservative or more radical operations.
6. Atrophic rhinitis.
7. Chronic tonsillopharyngitis, with or without acute intercurrent attacks.
8. Chronic laryngotracheitis, especially suppurative.
9. Bronchiectasis.
10. Borderline cases, such as: *A.* Chronic suppurative salivary duct disease or any of the salivary glands. *B.* Fistulae about the head and neck.

As to the actual number of cases treated, it is surely irrelevant. Suffice to say that a large number have received the treatment in the past ten years, and the following conclusions are drawn therefrom:

CONCLUSIONS.

1. Although acute pathologic conditions have been subjected to foreign protein therapy, the results, in our hands at least, have not been encouraging.
2. While anaphylactic shock has not occurred in our series, its possibility should be borne in mind and a careful history should be taken, especially as to previous use of biological sera, and this particularly in children. Protein injection should not be given unless adrenalin is at hand for emergency use.

3. Clearly indicated surgery was not permitted to be superseded by nonspecific protein therapy and when it was employed in systemic contraindication to surgical intervention, its use was not attended by any noteworthy benefit.

4. The chill that has been supposed of prime importance in nonspecific protein therapy was rarely observed in our cases.

5. Other therapeutic measures, such as specific sera, vaccines, allergins, chemicals, physical agents, diet and endocrines, also possess definite nonspecific protein effects as adjuvants in our therapeutic attack upon disease.

6. It is not necessary to elaborate on the technique and dosages of the various substances employed in the treatment as mentioned above, since they are all, except the milk, dispensed commercially, and contain this information. As to the milk itself, we feel that pure certified milk, free from bacteria, not boiled, is preferable to milk containing bacteria and boiled, since the bacteria are additional protein substance and the dosage cannot be definitely controlled.

7. This conclusion I do not like to publish, and that is that too many men employ nonspecific protein therapy on the advice and information of commercial salesmen of the various milk, bacterial, etc., products without the necessary laboratory and scientific medical control. A sort of "hit and miss" proposition. This can only lead to the disrepute of the treatment.

185 North Wabash Avenue.

A NEW METHOD OF CONTROLLING HEMORRHAGE AFTER NOSE AND THROAT OPERATIONS.*

DR. T. CARROLL DAVIS, Philadelphia.

There is no doubt that bleeding is the most frequent complication or sequela to a tonsillectomy. I take it that this is an axiom. Certainly, bleeding is not the only thing that can happen, but when we consider the enormous number of tonsils that are removed, there is no other trouble to compare in frequency with hemorrhage.

Since these are the facts, surgeons have naturally given much study to ways and means of preventing or overcoming this bane to an easy mind. Numerous local applications and internal measures have been brought forth. We all have our preferences and at times have tried them and longed for more. Occasionally, we have resorted to suturing, which is the only absolutely efficient remedy in certain cases. I know that there are surgeons who suture routinely after tonsillectomies, but when we consider that a hemorrhage may occur at either pole or between them, I cannot see how even suturing can absolutely prevent hemorrhage and, because of extra trauma, it also tends to prolong convalescence. Suturing, as a secondary operation in unruly cases, requires more anesthesia, and that a general one, and certainly produces more trauma.

For these reasons we felt that we had an excuse for attempting to find a more nearly perfect styptic application. We wanted to reach the bleeding point and stop the flow of blood with the least inconvenience to the patient and to abstain from increasing inflammation or producing infection.

In order to reach every possible bleeding point we must use something that will cover the whole denuded area and also melt away so that it will not be necessary to pull it off, with danger of opening the vessel again. Gelatin seemed to be the best vehicle, and we had sheets made from the best French variety, with tricesol incorporated to destroy any spores and bacteria. This method of securing asepsis is used in antitoxins, etc. We experimented with the melting point until we had a gelatin that would quickly liquefy but which was still strong enough for our purpose.

*Read before the Philadelphia Laryngological Society, Nov. 4, 1930.

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There is a difference of opinion as to the value of gelatin itself as a styptic. Sollman¹ says of it: "The efficiency of gelatin is affirmed by some and denied by others. * * The contradictory data have not been explained." Stevens² says that gelatin "when applied directly to bleeding surfaces causes clotting." Osborne³ speaks of its use in solution for stomach and intestinal hemorrhage. It does answer our purpose as a vehicle, aside from any other quality it may possess.

When we began to study styptics we first tried the iron salts, hoping to get adhesion, but soon discovered that iron was irritating and that it made the gelatin insoluble and leathery. We tried "ferri-pyrin"⁴, a chemical combination of ferric chlorid and antipyrin, which was used some years ago. This did control the bleeding, but we still noticed irritation. After that we used a combination of antipyrin and tannic acid. This is the best styptic we have found. Hare⁵ describes its action thus:

"Locally applied, antipyrin possesses very distinct hemostatic properties, and for this purpose may be used in a 4 per cent solution, either in liquid or in a spray. Under these circumstances it seems to act not by producing clots, which are disadvantageous from the standpoint of antisepsis, but by constringing the bleeding vessels. This hemostatic property is very materially increased if a solution of tannic acid is added to it, when it forms a glutinous precipitate which controls the hemorrhage."

We verified this statement by finding that no clots were formed, but that a dry surface was produced. We were pleased to find that we hardly ever had a recurrence of the hemorrhage, a result which is certainly due to the constringing action on the vessel. Our perfected disks, therefore, are made to consist of very thin layers of an aseptic gelatin-glycerin base impregnated with antipyrin-tannin, cut and shaped to make them adaptable to their respective uses.

We found, however, that in order to place the disks properly we would have to devise an instrument, as the disc must be held firmly as it is delivered to the tonsillar cavity and while it remains there. Our first idea was to have it pushed into the tonsillar cavity, depending on its adhesive properties to hold it in place until melted. After experimenting we found that as we reduced the melting point of the disc, we also reduced its adhesive qualities. As the finally developed disc was one that would melt in about three minutes, there was no necessity of our holding it in place longer, the hemorrhage being arrested before that time.

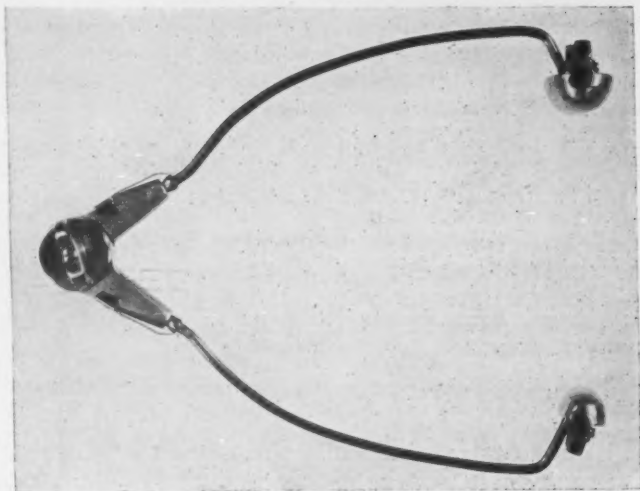
Our first instrument was made to hold the disc until it was in place, then push it off, but our latest instrument is constructed so

that it will hold the melting disc in contact with all the raw bleeding surface and, after a few minutes, remove the unmelted remainder with the holder.

In order that the surgeon may use the instrument like a tonsillar clamp or hold it in place, we have had it so made that it may be removed from the hinge and a handle attached. The two ends are for large and small sizes of discs, so that they may be accommodated to the tonsillar cavities of either adults or children.



Holder for medicated gelatine disc.



Holder for medicated gelatine disc.

We have now to consider the safety of our styptic. Concerning the dose of antipyrin, it has been suggested in amounts as large as 15 gr. (1.0). In a child of 5 years a dose of 2 gr. (0.12) is recommended. Osborne⁶ gives a dose of 0.05 gm. or a little less than a grain for every year of the child's age. We use only about one-fourth to one-third grain of the antipyrin-tannic acid to each disc, a perfectly harmless quantity.

After submucous resections, we have used discs shaped similar to Simpson splints beneath the usual packing, and we feel that they help to control the bleeding. We have also used the tonsillar discs in other nasal operations and have encountered very much less bleeding as a result, but the shape for application to these surfaces can be improved.

It is difficult to determine how large a vessel may be closed by this method, but we have stopped spurters that we previously would have ligated or sutured.

We found failures to be due to our not bringing the styptic into actual contact with the bleeding point or area. Since a clot is not formed, but the mouth of the vessel closed instead, we feel that this method of hemostasis can be used with hemophiliacs. We have not had the opportunity properly to determine its efficiency in such cases, but we feel that it is reasonable to expect good results.

We asked a few dentists to use properly shaped wedges after tooth extractions, and they have reported very good results. In one case which the dentist claimed to be a hemophiliac, the hemorrhage was controlled immediately and without recurrence.

We have secured prompt control of epistaxis, both postoperative and spontaneous, but we realize that our conclusions must be tempered by the limited number of cases on which we have used this method.

CONCLUSIONS.

1. A gelatin disc is the best vehicle for applying styptics to the tonsillar cavity or other bleeding surfaces.
2. Tannic acid-antipyrin is an excellent styptic for local application.
3. We do not hold that the method advanced will eliminate suturing for hemorrhage following tonsillectomy, but we are convinced that less of it will be necessary.
4. When used by one unaccustomed to suturing or unequipped for that procedure, these discs will be of great service.
5. The medicaments are used in amounts that are not toxic.
6. In halting the bleeding after nasal and dental surgery the discs have a real use.
7. They have possibilities of controlling bleeding in hemophilia.

In closing, I want to thank Dr. C. E. Vanderkleed, Superintendent of the firm of Robert McNeil, for his advice and assistance, as well as for the frequent use of the firm's laboratories in preparing the discs.

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- 3128 N. Broad Street.

THE CONTROL OF HEMORRHAGE IN TONSIL OPERATIONS.

DR. CARL KAPLAN, Brooklyn.

Should tonsillectomy be classed a major or minor operation? This is still a mooted question. Years ago it was considered a slight or minor procedure. Today many accepted authorities refer to this operative procedure as one of great importance. Why this change? Has the operation become more difficult, or is it being regarded from a different point of view?

In the opinion of the writer tonsillectomy should always be considered a major operation. Special training is required to be able to perform this surgical work thoroughly and completely. The surgeon must be able to check and control any bleeding which occurs during the operation, or at any time thereafter. This can only be acquired after one operates on several hundred cases.

When the suggestion is made that his tonsils be removed, the patient asks the following questions: "Will there be much bleeding? Can you perform a bloodless operation?" The phobia of hemorrhage is naturally more prevalent in adult patients.

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It is of utmost importance that the specialist rule out and avoid operating on hemophiliacs. This can be determined by performing a coagulation and bleeding time test on all patients, male and female. But, to give a description of the anatomical relationship of the blood vessels supplying the tonsils would be too didactic. It is assumed that a surgeon is at all times thoroughly familiar with the anatomy of his specialty.

The method of narcosis has some bearing on the bleeding. Under general anesthesia there is apt to be more oozing, due to the relaxation of the tissue and blood vessels. Local anesthesia produces less bleeding, due to the action of the adrenalin which is usually added to the novocain.

The young interne who has operated on ten or twenty tonsil cases may feel confident that he can perform a tonsil operation, until he encounters his first bleeding case. After spending several sleepless nights worrying over the case, he vows never again to operate on another. The same experience can be repeated for the general practitioner who operates on his private tonsil cases.

The tonsillectomy is completed. The operator notices blood in both tonsillar fossae. After waiting several minutes and attempting to arrest it by sponging, the bleeding still continues. The surgeon becomes worried. The amateur specialist or practitioner cries out for additional instruments. In his excitement he discards a few by throwing them on the floor of the operating room. This display of anger is a sure indication that the operator has lost control not only of himself, but also of his bleeding patient. In this emergency the surgeon must demonstrate that he is master of the situation, by acting calmly and adopting a definite plan of action. This manner of behavior can only come to one of long experience and excellent surgical judgment.

Whatever the general method and consideration involved, the author has for many years followed one method to arrest hemorrhage in tonsil cases. It has proven its efficiency in hundreds of cases, not only in the writer's own cases, but also in those of his assistants. It has proved so worthy that one of the writer's assistants has named it the "Kaplan One-Two Method." It may be added that the author has performed thousands of tonsil operations, and up to the time of this writing he never lost a single case due to hemorrhage.

The method of applying the Kaplan one-two clamp is as follows: One must remember that after the tonsils are removed, there is visible from front to rear the anterior pillar, tonsillar bed or fossae, and posterior pillar. Bleeding usually occurs in the tonsillar bed near the

inferior pole. To stop this bleeding, two hemostatic clamps are used. One is a straight, thin clamp, called No. 1. The second is a curved Schmidt tonsil forceps, called clamp No. 2. Clamp No. 1 is applied to any part of the soft tissues in the tonsillar fossae and a small portion of this tissue is grasped between the blades. This is used only as a tractor. The application of clamp No. 2 is the important part of this method. No. 1 clamp being held in the left hand, the second, or Schmidt's curved tonsil hemostat is opened and carried behind clamp No. 1, the point of clamp No. 2 pointing downward. At this point an attempt is made to obtain as much of the tissue as is possible and grasp it between the blades of No. 2 clamp. As soon as this is accomplished, clamp No. 1 is released and clamp No. 2 is left *in situ* for about two or three minutes. At the expiration of this time, clamp No. 2 is removed. This marks the end of any bleeding. The tissue which was held in between the blades of Schmidt's clamp appears upright, like a column. This is not tampered with.

If the bleeding occurs an hour or several hours after the operation, the procedure is amended very slightly. The clots are removed. A small piece of absorbent cotton, moistened with 4 per cent cocaine and adrenalin, is inserted into both tonsillar fossae and left there for several minutes. Upon the removal of this cotton the bleeding point is visualized. From this point "Kaplan One-Two Method" is applied exactly the same as described above, with this exception: No. 1 clamp is applied directly to the bleeding point, and clamp No. 2 applied to the region immediately posterior to clamp No. 1.

If the bleeding takes place a week or ten days after the operation the procedure is the same as though the hemorrhage occurred several hours after the operation. Here the operator must exercise utmost care in handling the tissue, on account of its great friability.

The writer recommends this method to his colleagues, feeling confident that their bleeding cases will be reduced to a minimum.

967 Forest Avenue.

THE MODERN AURAL IRRIGATOR WITH AUTOMATIC CONTROL.

DR. GERVAIS WARD MCAULIFFE, New York.

Water as a vehicle for antiseptic solutions has long been used as an adjunct in the treatment of various diseases of the external ear. The modes of application have been many and varied. The most familiar beginning was the fountain syringe or douche bag, which has long suffered from cosmopolitan usage. Then followed the ear syringe, the first type being the rubber bulb and later the all-metal piston ear syringe familiar to every office and clinic of today. Control of the pressure proves to be the first stumbling block to satisfactory irrigation of the canal when using the fountain syringe or ear syringe. In the former the pressure is controlled by gravity and, of a necessity, is never accurate and rarely, if ever, of sufficient degree to remove foreign bodies from the canal. With the latter the pressure is controlled by hand. The temperature of the irrigating fluid could never accurately be gauged. It was usually tested with the finger or on the lobule of the patient's ear. Despite these failings, the syringe continues to form a staunch bulwark in the treatment of diseases of the external ear and canal.

As an end-result, however, these shortcomings of the present-day irrigation have caused a wide diversity of opinion as to the wisdom of employing aural irrigation of any description. Trauma of the canal, maceration of the delicate tissue of the canal and drumhead, fostering the growth of bacteria, causing the birth of acute mastoiditis, prolonging the disease and delaying the healing are a few of the charges laid to the door of the present-day irrigation. In consequence there has sprung into being a definite sect of otologists who have condemned the use of irrigation of any form in the treatment of diseases of the external or middle ear. This group advocates the "dry treatment" and bans the use of water in any solution.

To an impartial observer and to quote a time-honored aphorism, "Irrigation has been more sinned against than it has sinned." How many textbooks describe the technique of irrigation? How many nurses are instructed in the proper technique of syringing an ear? The answer is surprising. Rarely, if ever, is there mention in our textbooks of the technique of aural irrigation. Rarely, if ever, can

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one find a graduate nurse or a nurse with post-graduate training in ear nose and throat that understands the technique of proper irrigation of the aural canal. There is a surprising lack of knowledge concerning the anatomy of the canal and drumhead, a primary essential to proper irrigation. Is it then the fault of the irrigation or irrigation improperly carried out that we owe our present wide diversity of opinion?

In Dr. Keller's excellent textbook recently published, the author says: "I failed to see one case where the healing was delayed or there was any injury done to the canal or drumhead by irrigation properly done."



Up to the present time there has been no attempt made to devise an instrument which could regulate automatically the pressure as well as the temperature of the irrigating fluid, to whatever degree of temperature or pounds of pressure desired. These two factors have long been realized to be the main drawbacks to present-day irrigation. Excessive pressure causes injury to the canal or drumhead in careless hands and too hot or too cold a temperature causes stimulation of the labyrinth, with its chain of unpleasant reactions.

After considerable experimentation in the Department of Otology at Cornell a machine was evolved to fulfill these requirements. The description of the machine follows:

The apparatus consists of a table with a shelf and drawer, mounted on large, easy-rolling, rubber-tired castors, with an air compressor mounted on the shelf. On the top table is mounted a mircord automatic electric switch. This is designed to start and stop the air compressor at low and high pressure. The pressure is generally set at 15 to 25 pounds, depending upon the desire of the operator. After the air has been generated by the air pump in the small reserve tank and tubes, it is then led through the pressure regulating valve. Here it is regulated to the desired pressure for forcing liquid from the bottle to the ear canal of the patient. This valve permits just the amount registered by the operator on the pressure dial to enter the bottle, no matter what level the irrigation fluid has reached. Through the bottle cap there are two tubes and attached to one is the electric heating rod. The short tube leads the air pressure, which has been regulated by the valve, to the surface of the irrigation fluid. The long tube reaching to the bottom of the bottle carries the irrigating solution to the ear canal of the patient.

The heating unit should always be immersed in solution when the current is on, otherwise the resistance coil will burn out. The heat is controlled by a switch at the top of the bottle, as shown in the accompanying illustration.

In back of the regulator and gauge is mounted a two-way stopcock for relieving the pressure in the bottle whenever it has to be refilled.

This unit can be completed with a suction bottle in a holder, suction gauge and regulator and silk-covered spray tube. In this way it constitutes a complete unit for spraying, suction and irrigation in all of its applications and can be wheeled from bedside to operating room or clinic without the least difficulty.

Operation: The bottle cap is removed and the bottle filled with the irrigating fluid, almost to the neck of the bottle. The cap is replaced and fixed by two thumbscrews. The amount of pressure for the irrigation is next regulated by turning the valve at II until the desired pressure is reached on the dial. For ordinary irrigation 10 to 15 pounds is sufficient for the removal of foreign bodies and impacted cerumen. As high as 20 pounds can be used with safety. The switch is now turned on, starting the air compressor, and the irrigation can be started with the desired pressure as soon as the automatic switch cuts off the air motor.

The machine has been in operation over a period of six months at the Cornell Ear Clinic. It has removed with great facility over 30 foreign bodies of various types in the external canal. Impacted cerumen of five years duration yielded readily to the continuous,

even persuasion of this type of irrigation. Over 1,000 cases had impacted cerumen removed in this fashion. A chronic, purulent otitis media with a large perforation no longer suffers from dizziness or nausea, because there is no stimulation of the labyrinth. Irrigations of every conceivable nature can be carried out with the utmost facility and under the strictest aseptic precautions. It has saved precious time at the clinic, where 20 irrigations might be the lot of one clinic session. The doctor is relieved of the burden of minor therapy, in that the operation of this unit is carried on by the nurse. During these four months there have been no unfortunate accidents, such as traumatizing the canal, dizziness and nausea, trauma to the drum-head or the introduction of infection into the antrum, the front door of mastoiditis. There has been a complete absence of pain, and its reception on the part of patient, nurse and doctor has been very gratifying.

I owe much to Mr. Sorensen, of the Sorensen Company, for the development of the idea. The machine is manufactured by Sorensen and Company, of Long Island City.

110 West 55th Street.

CHRONIC SUBGLOTTIDITIS.*

DR. RUDOLPH KRAMER, New York.

The three cases reported here presented an unusual condition, not so much from the clinical as from the etiological standpoint. The individual histories, in brief, are as follows:

Case 1: Female, married, multiparous, age 57 years, born in Russia; seen in January, 1920, in extreme dyspnea. There was a history of increasing dyspnea, hoarseness and dry cough for several weeks. On examination there was found a perforation of the cartilaginous septum, atrophic rhinitis and crusting with odor. The pharynx was red, the posterior wall glazed, covered with dried secretion, and the larynx was negative. The subglottic area showed a symmetrical, red, cushion-like swelling narrowing the airway to a chink 2 m.m. in diameter. This swelling did not shrink on the application of adrenalin. With the exception of the above findings, the history, laboratory tests and physical examination were negative. The Wassermann test, performed three times, was negative, as was the provocative Wassermann. Antiluetic treatment was of no avail. The patient was observed in the hospital for one month, during which time she was treated with laryngeal instillations and intravenous administration of neosalvarsan. Nine weeks after onset of illness, tracheotomy was required. Two weeks later tracheoscopy and dilatation of the stenosis was performed. This was repeated every two days. Little difficulty was observed in dilating the narrowing. The tracheotomy tube was removed five weeks later. The stenosis was then dilated at intervals of three days until a 9 m.m. tracheoscope could be passed easily. The intervals between dilatations were gradually increased from three days to three months. The subglottic swelling disappeared and except for the distortion due to the tracheotomy scar, the larynx and trachea are now normal, 10 years after the inception of treatment. There has been no recurrence of the original lesions or new disease processes at any time. Microscopic section of the tissue removed from the subglottic stenosis showed a non-specific chronic inflammatory process (Mandelbaum and Klemperer, Pathologists to Mt. Sinai Hospital).

*Read before New York Academy of Medicine, Section on Laryngology, March, 1930.

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Case 2: Female, married, multiparous, age 53 years, born in Russia; seen in June, 1924, complaining of increasing dyspnea for eight months. Her history was otherwise negative. General physical and laboratory examination, including the Wassermann test, were negative. The nose and throat examination was negative. In the subglottic region was a circular, red infiltration leaving a chink about 4 m.m. in width. A specimen was removed by direct laryngoscopy. This showed on microscopic examination, a nonspecific chronic inflammatory process (Mandelbaum and Klemperer, Pathologists to Mt. Sinai Hospital). The dyspnea increased in severity so that tracheotomy was required. One month later dilatation of the subglottic region was begun, using dilators of increasing sizes every three to four days. The intervals between dilatations were lengthened from three days to one week until a 9 m.m. tracheoscopic tube could be passed easily. The intervals were then gradually increased to one month. One-and-one-half years after tracheotomy, the tracheotomy tube was removed and the wound allowed to heal. Two years after operation the patient developed myocarditis and hypertension, with shortness of breath on exertion. Two-and-one-half years after operation the subglottic swelling had disappeared and the subglottic area was normal and has remained so. The patient now has diabetes in addition to her hypertension.

Case 3: Female, married, multiparous, age 54 years, born in Russia; seen in October, 1926, with a history of impaired voice and progressive dyspnea for two years. In addition there was a history of nasal trouble for many years. Nasal examination revealed atrophic rhinitis and crusts in the nose and nasopharynx. The posterior pharyngeal wall was red and glazed. The larynx was negative. The subglottic region showed a symmetrical, cushion-like, dark red swelling, which narrowed the airway to a chink about 2 m.m. in diameter. The history, general physical and laboratory examinations, including the Wassermann tests, were negative. Tracheotomy was performed. One month later, dilatation of subglottic swelling was begun. Specimen showed on microscopic sections (Gross and Klemperer, Pathologists to Mt. Sinai Hospital), an intense non-specific inflammatory process. Dilatation was performed every three to four days until a 9 m.m. tracheoscope could be passed and then the intervals between dilatations gradually lengthened to one month. Tracheotomy tube was removed about two-and-three-quarter-years after operation, when the subglottic swelling had receded to the level of the vocal cords. Three years after tracheotomy, the subglottic swelling had disappeared. The patient has been well since and there has been no recurrence or development of new lesions.

These three cases are similar in many respects, showing a gradation in severity of symptoms and of duration. They were women in the middle fifties at the time of onset of symptoms and Russian by birth. They showed the same lesion, a subglottic, red, cushion-like swelling with marked stenosis, and the larynx was otherwise normal. In two of the patients there was atrophic rhinitis with crusting. The history, the physical examination and the laboratory tests were essentially negative in each case. Antiluetic treatment was given in these cases with no effect. The excised tissue from the subglottic swelling showed nonspecific inflammation. The treatment was tracheotomy, followed by dilatation at frequent intervals until the lumen of the trachea was restored to normal, removal of the tracheotomy tube and subsequent dilatations (ambulatory) at less frequent intervals. Persistence in treatment was required, two to three years elapsing before a cure was effected. The question of etiology still remains to be considered. The only likely causes were rhinoscleroma and a nonspecific inflammation. Rhinoscleroma must be considered because of the birthplace of these patients, Russia; because two of them showed nasal lesions which, although not characteristic, might represent the end-stage of rhinoscleroma with secondary infection, and because of the appearance of a subglottic, symmetrical swelling with no other definite etiological factor. The microscopic examination of tissue excised from the lesion showed a nonspecific inflammatory process, which might possibly occur in the earliest stages of rhinoscleroma but we ought then to find the bacillus of rhinoscleroma in the tissues and this has not been possible in these cases. The lesions were, furthermore, of too long duration in two cases for the early microscopic picture to be present. In addition, the stenosis cleared up under simple dilatation; no other lesions have appeared and no local recurrences have been noted. We must therefore rule out rhinoscleroma.

This leaves us only the possibility of a nonspecific chronic subglottitis. I have postulated a chronic nonspecific inflammatory lesion localized subglottically, with no other laryngeal involvement, in persons peculiarly disposed to subglottic infections analogous to acute subglottitis seen in some adults. These patients, instead of acquiring an acute laryngitis, get an acute subglottitis without any involvement of the vocal cords or other laryngeal structures. The appearance of the subglottic region is the same as in the cases I have just described. The condition differs only in that they are acute and usually subside promptly under conservative treatment. I cannot explain this tendency to localize in the subglottic region except by

assuming a local tissue susceptibility to infections, which sounds very much like begging the question. Infants, however, more regularly show a tendency to subglottic involvement because of the extreme looseness and delicacy of the tissues of this region and perhaps a similar condition is the basis for the lesions occurring in adults. However we may try to explain it, the phenomenon remains a definite one. I have regarded these chronic cases as lesions beginning as mild acute inflammations which have persisted and progressed until chronic changes have occurred. It is very likely that the nasal disease present in two of these patients may have fed the infection to the subglottic region.

The importance of these cases is in the demonstration of the fact that all cases of chronic subglottiditis, especially when associated with ozenatous conditions, are not due to rhinoscleroma, as has been maintained by Pieniazek and others, and that we may have this type of laryngeal lesion as the result of a nonspecific inflammatory process.

121 East 60th Street.

International Digest of Current Otolaryngology.

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Halle, in the *Zeit. für Rhin.*, August, 1930, writes on the idiosyncrasies to adrenalin. He describes five cases in which he obtained local areas of necrosis due to adrenalin. Although a severe reaction of this kind is extremely rare, he suggests the following precautions to prevent its occurrence: Instead of the usual accepted ratio of one drop of adrenalin to each c.c. of novocain, one should use one drop of adrenalin to from three to ten c.c. of novocain. Immediately after the operation if an area of the skin is seen to remain particularly white, one should scarify it by means of needle punctures and then apply diathermy.

D'Onofrio, in the *Archivo Italiano de Oto.*, July, 1930, reports two cases of mastoiditis following blows on the mastoid process. He states that during the war this condition was not so rare, but in civil practice it is very uncommon. His first case was in a man of 60 years, who had been badly bruised over the mastoid process. The bruise cleared up in about two weeks, but on the twentieth day he came to the hospital with an acute mastoiditis involving the complete middle ear and with the membrane perforated. At operation no fracture of the bone was discovered, but all of the cells in the antrum were filled with pus. The second case was that of a man of 47 years, who fell, striking the tip of the mastoid against the projection on a chair. Next morning the mastoid area was swollen and painful and his symptoms increased in severity for the next two weeks. In this case the middle ear was quite normal. Operation revealed a small fistula through the tip leading into a cell filled with pus and granulation tissue with inflamed bone around it; the antrum was not involved.

The first case apparently was the result of an effusion of blood throughout the complete middle ear, which later became infected, while the second case was apparently one of a small fracture of the tip, which became localized in that part of the middle ear.

Hartsook, in the *Texas State Jour. of Medicine* for December, 1930, upholds the conservative treatment of chronic ethmoiditis. He recommends securing adequate ventilation and drainage by middle turbinectomy and correction of septal deformity and resorting to more radical procedures only after conservative efforts have failed. He reports good results in the treatment of selected cases of hyperplastic ethmoiditis by radium in the dosage of 100 m.g. hours repeated at ten-day intervals.

ROSENBERGER.

Lindemann, in the *Klinische Wochenschrift*, Berlin, Aug. 2, 1930, writes on the relationship of diseases of the mouth and diseases of the blood. He mentions the symptom of soreness of the tongue in pernicious anemia together with a vague soreness of the gums and throat. The author stresses the fact that a blood count is necessary whenever inflammations in the pharyngeal region show some unusual aspects. Among the conditions to be kept in mind are pernicious anemia, acute leukemia and agranulocytic leukemia.

Harper, of Glasgow, in *The Jour. of Laryngology and Otology*, December, 1930, writes on hidden infection in the maxillary antrum. He stresses the fact that in those obscure cases where X-ray transillumination and proof puncture are negative despite their suspicious clinical history, he has obtained marked relief by surgery. The pathological specimens of mucous membranes so obtained justified his diagnosis and the clinical results are extremely gratifying. Dr. Harper read this paper before the Scottish Society of Otology and Laryngology, and the discussion is also presented in the same issue of the journal. Much food for thought is given by this presentation.

B. de Rachewsky, in the *Press Medicale*, Paris, Aug. 20, 1930, maintains that hay fever can be cured by suggestion and that the effect of pollen is a delusion analogous to belief in the contagiousness of warts. He complemented his suggested treatment with small doses of morphin or codein, but in later years he has omitted the morphin and codein with equal success. He cites numerous cases, some extending over a period of thirty years, in which the patient was cured by suggestion. The real remedy, he states, is firm belief in the harmlessness of pollen. Many of his patients, armed with this belief, can go right into pollen fields without sneezing. He advances, as another conclusion, that hay fever is never observed in children under 8 years of age.

In the Archives of Internal Medicine for December, 1930, Byrd submits the present status of knowledge concerning sphenopalatine phenomena and their relief by anesthetization of the ganglion. The usefulness of this procedure in "afflictions as intractable as progressive deafness, as painful as migraine and as grave as glaucoma is such," he asserts, "as to command the attention of everyone who engages in the practice of medicine." ROSENBERGER.

Wishart, of Toronto, in the *Jour. A. M. A.*, Oct. 11, 1930, presents a most interesting article on the relation of infection of the ear and infection of the intestinal tract in infants. His summary is as follows:

1. Many authors believe that infection in the mastoid antrum is the cause of acute intestinal intoxication in infants.
2. Our medical staff believes that the type of the disease seen in Toronto is the same as that which exists in other parts of Canada and the United States.
3. Study of the disease has been pursued seriously for five years. For the last two years a large body of workers have co-operated.
4. The onset of the disease is rarely characterized by a "cold."
5. The great majority of the infants were without any clinical evidence of an upper respiratory infection at the time they were toxic.
6. Many infants remained without any ear infection throughout the whole course of the illness.
7. Accumulations or infections found in the mastoid antrums of infants at autopsy are antemortem in origin.
8. Both eardrums of many showed abnormality immediately preceding death. The change is an antemortem phenomenon due to forcible ejection up to the Eustachian tube. When mastoid infection exists, it is the result and not the cause of the child's lowered condition.
9. Mastoid antrum puncture for diagnosis of latent mastoiditis is not to be recommended.
10. Bilateral mastoid operation as a cure for the disease was a failure. Operation is to be postponed as long as possible.
11. The autopsies of the intensively studied cases of acute intestinal intoxication shows that mastoid infection was not common.
12. There was no correspondence between the bacteriology of the infection in the upper respiratory tract and that in the intestinal tract.
13. Evidence is being accumulated to show that the disease is of intestinal origin.

Conclusion: Infection of the mastoid antrum is not the cause of acute intestinal intoxication in infants.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTOTOLOGY.

Regular Meeting, Oct. 10, 1930.

Dr. Hugh B. Blackwell, Chairman.

The Histologic Anatomy of the Inner Ear, with Special Reference to the Cochlea (Lantern Demonstration). Dr. Marvin F. Jones.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

A Method of Determining the Density of Innervation of the Organ of Corti As a Whole and By Regions, and Correlations of Differences of the Same, with Differences in the Acuity of Hearing (Lantern Slides).

Dr. Stacy R. Guild, Dr. S. J. Crowe, Dr. C. C. Bunch and Dr. L. M. Polvogt.

1. A method has been developed and demonstrated, by means of which many of the spirally arranged elements of any particular cochlea may be represented, from properly oriented serial sections, in the form of graphic reconstructions with a fair degree of accuracy, and with a reasonable expenditure of time.

2. By means of this method, combined with the counting of the ganglion cells in the spiral ganglion, there has been determined, for each of 15 ears: a. the approximate total number of ganglion cells whose fibres supply the organ of Corti; b. for corresponding regions of ganglion and end-organ, the average number of ganglion cells per millimeter of length of the organ of Corti in the lower basal, upper basal, lower middle and upper middle plus apical regions of the cochlea; and c. the relative numbers of ganglion cells per millimeter in the several regions.

3. In four ears of young adults with good hearing the approximate total number of ganglion cells in the spiral ganglia averaged 25,614, with a range of from 23,193 to 27,810. For this group the average number of ganglion cells per millimeter of the corresponding region of the organ of Corti was as follows: lower basal, 934; upper basal, 1,076; lower middle, 971; upper middle plus apical, 502.

4. In three ears of young children the approximate total number of ganglion cells in the spiral ganglia averaged 29,019; in each ear there were more ganglion cells than in any case of the four ears of young adults with good hearing. For this group, the average number of ganglion cells per millimeter of length of the corresponding region of the organ of Corti was as follows: lower basal, 1,010; upper basal, 1,253; lower middle, 1,142; upper middle plus apical, 559. The hearing of these children had not been examined; our records do indicate that the hearing of children with normal ears averages somewhat better for all tones than that of young adults.

5. From the evidence furnished by the ganglion cell method the most densely innervated portion of the organ of Corti, in normal individuals, is that of the upper basal turn and the adjacent part of the lower middle turn, and there is a definite decrease in density of innervation at each end. Some preliminary attempts to count the nerve fibres in the osseous spiral lamina give the impression that there is a much greater decrease in density of innervation as the two ends of the organ of Corti are approached than is shown by the ganglion cell method. It is suggested that there is a correlation between these regional differences in density of innervation and the well recognized and proven differences in the energy required, in terms of ergs, for the threshold of hearing for different tones by normal individuals; it being least for tones of the middle range and progressively greater for those of both lower and higher pitch.

6. In three ears, each of which had a marked loss of acuity for high tones (and a slight loss of acuity for tones up to at least 2,048 cycles per second),

the approximate total number of ganglion cells in the spiral ganglia averaged 19,538; the highest and the lowest were, respectively, 20,808 and 18,504. For this group, the average number of ganglion cells per millimeter of length of the corresponding part of the organ of Corti was as follows: lower basal, 579; upper basal, 862; lower middle, 854; upper middle plus apical, 403. The amount of difference (loss) between these figures and those for the group of young adults with good hearing is about twice as great in the lower basal region as in any other. This indicates that the lower basal region is the one most concerned with the reception of high tones.

7. This view is strengthened by the fact that the number of ganglion cells in the better hearing ear of a woman, who was very hard of hearing for all tones, was much less in all regions of the cochlea than in the group with good hearing; the total number of ganglion cells in this spiral ganglion was only 4,437.

8. There are differences in the average density of innervation of corresponding regions of the organ of Corti in groups of ears with average differences in the acuity of hearing for tonal regions. These differences are of sufficient degree to indicate definitely that the relative density of innervation of the region of the organ of Corti stimulated by any given tone is an important factor in the relative acuity with which that tone is perceived. Analysis of the evidence from the groups indicates that the regions of the organ of Corti most concerned in the reception of all tones below about 3,000 cycles are located in the upper basal, the middle or the apical turns, and that the region of the lower basal turn is the one most concerned with the reception of tones of a frequency of c^5 (4,096 d. v.) and higher.

9. The more detailed analysis and comparison of morphological findings and functional records of the hearing in individual cases, of which two are reported in detail, furnishes strong evidence: 1. that for the reception of tones with a frequency near that of c^5 (4,096 d. v.), the region of the organ of Corti most concerned is located near the upper end of the lower part of the basal turn (about 8 or 9 m.m. from its extreme basal end); 2. that for tones near the frequency of c^6 (8,192 d. v.), the region of the organ of Corti most concerned is located at about the middle of the lower basal region (about 5 m.m. from the basal end); and 3. that all tones above the pitch of c^6 stimulate, for the most part at least, the structures of the lower fourth of the basal turn.

10. The condition of the lower half of the basal turn of the cochlea cannot be properly judged from functional examinations which do not furnish data of quantitative value with reference to the threshold of hearing for tones of c^6 and higher. For research purposes, if not for clinical, there is need of improvement of the instruments available for the examination of this tonal region.

11. In four ears in which definite conductive lesions were present, the acuity of hearing was not so good as the number of ganglion cells present would have indicated. This finding is in agreement with generally accepted theory. The fact that in all these cases the loss in acuity of hearing was proportionately greater for tones of the middle and high ranges than for the lower pitched tones is not in agreement with the generally accepted opinion as to the effect produced on the hearing by lesions of the conductive apparatus.

12. A correlation has been demonstrated between certain cases of the, in our material, most commonly observed type of defective hearing and the most frequently observed type of morphological defect of the cochlea: these being, respectively, loss of acuity (i. e., raising of the threshold) of hearing for high tones, and atrophic changes of the end-organ or of the nervous elements, or both, of the lower part of the basal turn of the cochlea.

13. The information yielded by these attempts to study the density of innervation of the organ of Corti is of sufficient interest to justify further efforts to improve the methods of both functional examination and morphologic study.

DISCUSSION.

DR. E. P. FOWLER: I should like you to tell me how any mere otologist can discuss a paper like this. It is absolutely impossible to do so from the standpoint presented; from the basic factors and the parallelism of definite cases.

All I can do is to point out possible points for discussion for the correlation of these findings with what we find in our practice. Not knowing exactly what was in this paper, I have chosen some slides to show you and will present those which are pertinent and which I think may help you to better understand certain points.

This research of Dr. Guild's, of course, is basic work and will stand, no matter what the correlation will ultimately prove to be; it will, moreover, open up lines of thought for further study.

In discussing the beautiful slides shown by Dr. Jones I can do no better than show some myself.

Slide 1 shows the human ear, cut through the oval and round windows, stapes, footplates, etc. (this was made by Dr. Shambaugh). I would point out the enormous size of the perilymph space inside of the oval window; the small size of the scala tympani in this location, the minute size of Corti's organ, etc. This is not the usual impression we get from the pictures in textbooks.

Slide 2: This shows the different types of curve found in testing the hearing capacity, of different ears. It shows graphically the three main types of hearing loss, i. e.: a. progressively more from the high to the low tones; b. approximately an even loss for all the tones or for the high and the low tones; c. a progressively greater loss from the low to the high tones. As subtypes are shown: one with a tendency for the sudden rise in hearing, and one for a sudden diminution in hearing, both occurring in the upper part of the tonal scale. It should be remarked in passing that in the lower tones we don't get violent variations. In other words, if one of the low tones is down, the tones lower than this are regularly also down.

Slide 3: An audiogram of obstructive deafness we diagnosed as otosclerosis, showing the progressive losses of hearing during the past eight years. You can see exactly the manner in which the hearing went down. Until we have examined many cases like this after death, no one can tell exactly what the lesions were.

Slide 4: An audiogram showing marked improvement in the hearing in one ear, but no change in the hearing by bone conduction between the two examinations. One of the things I noticed in Dr. Guild's paper was the fact that he did not show any bone conduction data. Unless he takes the bone conduction for the various frequencies, how does he know whether the loss of hearing is due to an obstructive lesion or to a nervous lesion, and possibly in the spiral ganglion cells. It is true that obtaining accurate bone conduction data is more difficult than obtaining air conduction data, but it can be done if proper technique is used, and it gives valuable information, no matter whether we fully understand it or not (as a matter of fact, the same or little more may be said for air conduction data).

Slide 5: This slide shows the intensity limits procurable by the use of the tuning forks compared with those obtained by using the 1-A audiometer. There should be no mystery about the audiometer. The tones it produces may be compared to tuning forks, which by some contrivance could be made to stop losing volume during their decrement, so that instead of constantly dying down the sound could be listened for again and again at a given intensity or one slightly above or below any given intensity.

Slide 6: This audiogram was obtained from a case, the middle ear of which was full of fluid. When the fluid was absorbed the hearing for the low tones improved, which is according to all textbooks. But the low tones don't always act like this.

Slide 7: This audiogram shows the hearing of an ear undergoing an acute nonsuppurative inflammation with much congestion in the attic. The dotted line shows the improvement following Politzerization, and though this was slight, the patient thought it of marked benefit (this is the usual reaction). You will notice as the hearing returns toward normal that the high notes progressively improve. This coincides with Dr. Guild's statement that he also has observed this phenomenon. In other words, in some obstructive lesions the high notes are affected and not the loss, as is taught.

Slide 8: This shows an experiment I did some years ago. 1. A lead weight was attached over the umbo and the hearing taken with the patient first in the vertical position, which brought down the low tones some, but brought down

decidedly more the high notes. 2. When the patient was placed in the horizontal position, the high tones were markedly improved, probably because of the weight of the shot increasing the tension of the drum membrane. So you see it is not so simple to determine from the usual functional tests alone whether the loss of the high notes is due to an obstructive lesion or to a nerve lesion.

Slide 9: This shows another ear in which the shot was attached over the umbo, but the result was slightly different. Now, after the removal of the shot from the eardrum of both of these patients, the hearing returned to its original state. We have to consider the effect not only of the nerve elements in the cochlea, but the varying effects of the changes in the inertia, tension and friction in the conducting mechanism, because many of these changes may show audiometric measurements simulating disease in the nervous mechanism.

Slides 10 to 15: Several slides showing cases where the air conduction curve coincides more or less closely with the bone conduction curve and several slides showing no such coincidence. In which of these cases would one suspect involvement of the ganglion cell or any other cochlea or more central elements, and in which would one suspect only obstructive lesions? Long ago our great grandfathers may have said such and such a patient had fever, and "that's what's the matter with him," but what kind of fever? Today we are doing but little more for the deafened than saying he is deaf, although we try to differentiate between obstructive and nerve deafness. Now, what kind of an obstructive deafness and what kind of a nerve deafness is the patient suffering from? Dr. Guild is trying to find out where one nerve lesion is located. There are others which in time will be unearthed.

16. I now show you three common examples of deafness, which if diagnosed by the usual criteria, even with the extensive data shown, might lead one far astray from the truth. The first picture looks like a mixed deafness, the second like a nerve deafness, and the third like an obstructive deafness (probably otosclerosis). You will notice that the bone conduction is shown for several tones, but is not shown for the complete range in any of these pictures. Now, if these three pictures are placed one upon the other we will have a slide which shows (Slide 15) a complete examination of these cases charting the losses for the air conduction and the bone conduction in similar units of measure. In other words, these three examples were taken from one and the same case, being but different portions of the complete examination shown. Though this patient had interstitial keratitis, it does not follow that she has a specific deafness.

I want to stress the necessity of making a complete examination in every case. A complete examination not only by air conduction, but by bone conduction as well. Sounds heard by bone conduction are apparently shunted around obstructive lesions, so that they are not diminished unless there is some trouble deeper than the middle ear. Dr. Guild deserves the highest praise for this careful and laborious work. He is not stating theories, but simply the facts as found by him.

FRANK H. PIKE, PH.D.: Ever since the lecture began I have been wondering just what I might say. I probably use the microscope less than any other neurologist in captivity. Probably everyone of you has more slides of the ear than I have, so in one sense I am in a rather bad way to contribute anything to this discussion. The papers of the evening, however, have been extremely encouraging. I think the progress of youth to mature years, either in an individual or in a science, is one from a very positive condition to something that is a little more skeptical at times. There was a time when I thought I knew what light was. That was when I was a student. I am not sure that anyone can tell what light is now. However, we don't feel that there has been no progress in physics because of this gain in skepticism. When I think of that condition and compare it with the positiveness of some of the statements that we hear today, I am a little skeptical. Perhaps I don't take psychanalysts quite so seriously as some do; I think there are none here tonight, therefore I am safe until I get out of the door.

The matter of the ear differs somewhat from that of the eye. We have no particular geometry in the ear. Geometrical optics long ago showed us how to get an image in the eye. In the matter of central lesions we may get a

quadrantic hemianopsia, just as you take a section out of a pie. I don't know of any similar geometry in the case of hearing that will enable us to tell what part of the cochlea or of the central pathway is affected. And again, in these cases of visual hallucination the appearance of the pink elephants and other bizarre beasts in the procession, which are supposed to be rare these days—perhaps because the alcoholics do not live long enough to get many of them—there used to be certain forms. Even in visual hallucinations the geometry persisted. Hallucinations of hearing may be said to be voices, but the cases that I have seen could not tell what those voices said. Auditory hallucinations are deserving of more careful study. This element of the lack of ear geometry has placed the otologist at a disadvantage in the analysis of the part of the ear concerned in the perception of the particular sound or frequency. I think several of us long ago discarded any theory of hearing now prevalent, or at least considered them only as possibilities, to be taught to the students if we had to, but in our own minds to be kept under advisement.

The progress that has been made since I was a student is extremely interesting. Within that time we have had a revision of the histology of the tectorial membrane. In all the textbooks that membrane was shown as lying loose. Then, through the work of Shambaugh and Hardesty and others, only a few years ago, it was shown to have a definite relation to the organ of Corti.

In the matter of the correlation of lesions in different parts of the cochlea with defects in hearing, it comes back to that old observation of John Stuart Mill, probably more familiar in the form which Koch gave it in his laws of bacterial causation of disease, that the one condition shall always be present when the other condition is present; that one condition shall always be absent when the other condition is absent; and that the two shall vary concomitantly. Dr. Guild has got together a certain number of cases. I think his attitude tonight is that we are attempting a biological induction. In all the cases that have been examined these deductions seem to hold true, which is extremely encouraging; and it is a matter of considerable interest to know about how many ganglion cells there are.

There seem to be certain possibilities of a peripheral analysis of tone. Within the past year Wever and Bray have shown that one may have reproduced in an amplifier a tone of the same pitch as that which stimulates the ear. We do not know the speed of conduction of the impulses along the auditory nerve, or the refractory period, but we do seem to know that one may get in an amplifier the same frequency that is communicated to the ear. To this extent we seem to have a peripheral analysis of tone in the ear, much as we have a peripheral geometrical analysis of form in the eye. It appears wholly natural to suppose that one part of the cochlear structure should be associated with the perception of a particular frequency of tone. It seems very probable, on the basis of the data which we now have, that we may know something about the particular region of the cochlea in which a particular frequency may be heard. We may only hope that in the hundredth case which Dr. Guild examines he will not find the relationship reversed.

DR. E. G. WEVER: I feel in even worse position than Dr. Pike expressed himself tonight, for I am neither neurologist nor otologist nor anatomist, but merely a psychologist, who has become interested in the ear.

The work of Dr. Guild has impressed me very strongly as of tremendous importance. We, of course, need more cases before drawing any final conclusions, but the evidence looks like more than a mere correspondence between the two sets of data; it points rather toward a casual relationship between them.

I should like to mention in this connection some work that Dr. Bray and I have been doing at Princeton as a part of our auditory nerve experiments (to be reported at your next meeting), because this work may perhaps be explained by Dr. Guild's evidence. We have tried to cut particular portions of the auditory nerve of the cat at the point where the nerve enters the medulla, testing the effect on the nerve response by placing the leading-off electrode either on the proximal part of the nerve or on the other side of the medulla. In all our attempts so far we have never reduced the response to a small "island" of tones, but have always found merely a reduction in the range of tones mediated by the nerve. This result may indicate, as Dr. Guild's evidence suggests to me, that intensity of acoustic response is a function of the number

of nerve fibres available. This occurred to me this evening, and I mention it as a possible correlation of two types of data. Whether in our further nerve-sectioning the result mentioned will be corroborated, I don't know. The experiments are only in a preliminary stage.

I do not know that I agree with the previous speaker in the interpretation of the work of Dr. Bray and myself on auditory nerve responses as indicating the peripheral analysis of tones. Perhaps I ought to leave discussion of that matter until later, when it will be considered in my own paper. Just now I must say that I should like to leave the question open.

Mr. R. L. WEGEL: Dr. Guild's paper has been unusually interesting to me on account of the wealth of information of an anatomical nature contained in it which is directly utilizable in the method of approach to the ear problem which I have been following for the past ten years. During his discussion many questions occurred to me which I would like to have asked to further illuminate some of these points, but the time is so short that I will refrain from going into these matters, and confine my remarks to a few of the extra-morphological conclusions at which he seems to have arrived.

The first point is in regard to his interesting demonstration of the correlation between the audiogram and the atrophy of the organ of Corti, or its associated nerve terminations, or ganglion cells. Back about 70 or 80 years ago Helmholtz showed on theoretical grounds that the higher frequencies must be effective in stimulating the organ of Corti at its proximal end, and that the low frequencies stimulated the distal end. About ten years ago, with the help of some new quantitative data on pitch sensibility, I made a calculation of the distribution on the basilar membrane at which various frequencies were effective in producing a stimulation of the nerve terminals. The calculation of the average position was published, but calculation of specific cases was omitted. It was found, however, that no single ear conformed to this average distribution, but that the place at which one frequently stimulates the organ of Corti may vary by a matter of 4 or 5 m.m. with different individuals. The data which Dr. Guild has presented is a striking confirmation of these calculations, and I find it difficult to understand why he is so reluctant to accept, even tentatively, the results of his own experiments, unless it be perhaps that these results were first predicted by this rather fearsome method of "theory."

The second point which I would like to mention has to do with his apparent sureness of his conclusion that the sensitivity or acuity of the organ of Corti at any place is related specifically to the number of ganglion cells which his sections show to be histologically intact. I take it that since it was not mentioned, that Dr. Guild wished to imply that when histology shows these cells to be intact they are also functionally normal; that is, I was under the impression that if at a given point along the membrane there should be normally 500 ganglion cells per millimeter in the normal individual and a subject was found in which 250 were structurally intact, then these are still functionally normal in spite of the atrophy of their neighbors. The point is that he might just as well and more properly have concluded that the loss in function of the organ of Corti at such a place was due to the subnormal activity of the remaining cells. Experience with other sense organs, such for example as the eye, of which a great deal is known at present, has shown that sensitivity or irritability of a given sense area is not a function of the number of nerve terminals except perhaps in a very secondary way, but that the number of such nerve terminals has to do with the power of the sense organ to discriminate in intensity and change of position on that area of the stimulus. In the particular case of the ear a reduction in the number of nerve terminals in the organ of Corti, or in any other equivalent atrophy, must result (if the remaining cells are functionally perfect), not in an appreciable change of acuity as proposed by Dr. Guild, but must result in the ability of that particular area to discriminate in pitch and in intensity of sound which is effective there.

Dr. Guild thinks that there is too much theorizing and too little experiment. His armchair philosopher is, of course, a ridiculous specimen and the results of his mental activity must be discounted with discrimination. I do not believe that if Dr. Guild understands theory to be merely a correlation of experimental results, which it properly should be, he can feel this way about substantial theory. Experiments without interpretation are of no use whatever.

The thing which is of use is the interpretation and consequences of these experiments. We have hardly begun to digest the existing data so I believe that there should be more theory, even at the expense of less experiment. In the hearing problem, physiology and physics, which are primarily sciences of logic or "theory," are more important than morphology, although they are dependent on it for fundamental data. It is these essential data which the very remarkable work of Dr. Guild is furnishing.

Dr. STACY R. GUILD, closing: With reference to Dr. Fowler's discussion of bone conduction, I would say that I wish I knew how to do really satisfactory bone conduction examinations or how to interpret the results obtained from such tests of function. The great puzzle is as to what it all means. There is a great deal of work yet to be done on this phase. The reason why we have done so little in the way of bone conduction on these cases which we have shown of our routine material is that, because of their general condition and the ease with which they become fatigued, we have found it necessary to limit our total examination of a patient to not over 30 minutes, including time from the ward and return to the ward; therefore, we can do so only on those things which seem most worth while. In many instances we have to take the apparatus to the bedside. I wish we did have more bone conduction data.

As to Dr. Pike's discussion, the hundredth case is probably coming along and will make plenty of trouble for theorists. I would call attention to the fact that we were very conservative in stating that these lesions which have been found were the only causes of the defective function. Other factors may have been overlooked entirely.

This also answers Dr. Wegel's remark about why we are unwilling to draw more definite conclusions from our data. I think it is interesting to note that what we believe to be the location of reception for c^5 is about 25 per cent from where you located it by theoretical methods. As I remember, you placed it 5 or 6 m.m. from the round window. I feel myself that we cannot yet locate it very exactly. There are great differences in the dimensions of individual cochleae; that topic is a byproduct of this study. I found marked variation of the width of the basilar membrane of the guinea pig some four years ago; 35 guinea pigs were studied. With no other animal have any such measurements been made in more than one or two individuals. People vary in other size dimensions, so why is it not reasonable to expect cochlea variations in about the same ratio? And structural variations doubtless do affect the location of functional regions.

Now, as to the sensitivity question: Our belief is that the data presented indicate that sensitivity and density of innervation are correlated in some general way, but we have not yet got it down to a point susceptible of mathematical expression.

As to the correlation with retinal findings: Are we justified in making such correlations? For the ear, the work of Retzius in '92 is the best we have on the finer details of the innervation of the organ of Corti. The only work I know of that approaches it is a study by a Czech, whose name I cannot recall. I could not read the article, but had it translated. He did not go beyond Retzius' results. Certain essential anatomical points are necessary for all theoretical work; among other points the following: 1. How many nerve fibres have terminations on one hair cell? 2. How many hair cells receive collaterals from one and the same nerve fibre? 3. How many cortical cells, in the auditory sensory area, receive stimuli by impulses coming from one spiral ganglion cell? 4. How many spiral ganglion cells send impulses to one and the same cortical cell? There are absolutely no data on these very essential questions.

In the retina we know more about essential structure. I will call attention to only one thing—you will all think of others: The rods and cones are cells of the first order, and the ganglion cells of the retina whose neuraxes from the optic nerve and tract are neurones of the third order. These ganglion cells are much less numerous than the rods and cones, therefore there must be considerable summation of stimuli. It is difficult to transfer conclusions drawn from the study of vision to the interpretation of hearing phenomena, and I question the advisability of attempting to do so until the essential morphology is better known.

THE PHILADELPHIA LARYNGOLOGICAL SOCIETY.

Regular Meeting, Tuesday, Nov. 4, 1930.

A New Method of Controlling Postoperative Hemorrhage Upon the Nose and Throat. Dr. T. Carroll Davis.

(Appears in full in this issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. LAESSLE: I would like to ask Dr. Davis if the preparation of tannic acid and antipyrin is a combination forming a new substance or is it a tannated antipyrin?

DR. BRICKER: Dr. Davis is to be complimented upon the modesty of his paper. As we all know, there is a tendency to be a little too enthusiastic in our claims for any particular procedure to control hemorrhage. I have had occasion to use Dr. Davis' hemoresters both in tonsillar and adenoid bleeding. It is remarkable what a dry field is obtained in a few moments after the application of these discs to a bleeding area. It is far superior, to my mind, to the use of styptic fluids, such as solutions of gallic and tannic acid, and it is much safer, in that there is less fluid to be aspirated into the lung.

DR. HARTZ: I would like to ask Dr. Davis how long the glassy appearance lasts. How soon after application is oozing apt to appear?

DR. HEWSON: I would like to ask Dr. Davis how often he gets soreness of the throat after his application. My experience has been that the fewer chemicals we use, in this respect, the better.

DR. ANDERS: For the past year I have used Dr. Davis' films in the hospital in that class of cases where you don't know whether to suture or not and are afraid to run the risk of sending the patient back to his room or ward, so that you suture. Every case has been successful and the bleeding has been controlled. I do not know of any after-effects or hemorrhages that have recurred. There are no particular after-effects from it. Of course, if the hemorrhage is coming from an artery and spurting, I have not tried it in these cases. In these cases we sew them up as it would not be safe to send them back, even if the hemorrhage were controlled.

DR. DAVIS, in closing: Concerning tannate of antipyrin, as Dr. Hare says, when you mix a solution of tannic acid and antipyrin you get a precipitate. We dry that precipitate and spread it over the disc. Some chemical reaction takes place, because it is no longer soluble in water, and both tannic acid and antipyrin are soluble before they are mixed.

Concerning oozing after operation, I presume Dr. Hartz means oozing of blood. The surface has remained dry indefinitely. There is very little secondary bleeding. I do not remember one case in which I have had a secondary hemorrhage.

Soreness of Throat: We studied that quite a great deal. A friend of mine used it on a case, only on one side of the throat. The next day he told the patient he had used something on one side and asked him which was the sorest. The patient told him the opposite side. I have not found any more soreness after application, and I examine the throats daily for several days; neither did I ever see any sloughing or any untoward reaction.

Treatment of Diseases of the Ear, Through the Eustachian Tube, with Consideration of the Indications and Difficulties. Dr. M. Valentine Miller.

(Appears in full in this issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. COATES: Dr. Miller has given us a very complete description of this technique. There should be reprints made of this paper to give the postgraduate students each year.

I have been using this method since 1910—for the past 20 years. There is no doubt in my mind that this method, taken all in all, is the most effective way for treating deafness of tubal origin. In chronic cases you can, if your cases will come in regularly enough, and if you take time, do a great deal of good. Lots of my old patients that had treatments years ago come back for a treatment now and then, and they always say they want the "wires."

The main objection to this method and the reason it has not become more popular is because of the amount of time necessary to use it. It does take more time than simply catheterizing the tubes. When your office is full and appointments are waiting, there is a temptation to put off the patient that requires this treatment. That is one of the reasons why it has never become more popular. The more time you spend with your patient, the better will be your results.

The shrinking part of the technique has always seemed to me the most important. If you are using a catheter, always follow with medication. Yankauer's bougies are too soft and flexible to get in where there is a tight stricture. There are some cases where it is hard to get an applicator in, but a bougie will go in more easily. I believe in shrinking the mucosa in order to have an easier passage. There is also much less danger of getting emphysema. While you are passing the applicator up the tube, a little gentle pressure will help to get it through the isthmus.

I know of two cases where the wire broke. One had had the cotton burned off and the other had been boiled with the cotton on and had been used over and over again with the same cotton. The danger of that is that you have rust under your cotton and the wire breaks. If you lose the tip of the applicator, it may be a serious thing.

When we first began using this method, Yankauer advised a half-inch of cotton on the end of the wire. We have been using 2 inches of cotton, because you can then apply more medication the whole length of the tube, and it also makes for greater safety. The danger of carrying infection up the tube is a possibility. I have had but two cases in 20 years where infection did occur afterwards. Both of these cases were either developing nasal infection at the time or else became infected very shortly afterwards.

You probably know the variation in this method. Bordley puts a kink near the tip and passes that up without cotton into the ear, watching it through the drum. I do not believe it is a good method.

There is just one more thing. We all know how difficult it is to remove synechia. You can control these things by taking a little bit of celluloid film and cutting it into a plate that would fill the nose. This is placed between the cut portions of the synechia, as described by Blakesley, of Kansas City. The method is most efficacious.

DR. WIEDER: I am very much interested in this paper. It was good to hear someone call attention again to the importance of treatment of the Eustachian tube. It is true that the method takes quite a bit of time and the patients have to hang around the office, and for this reason you get in the habit of neglecting the method. It is, after all, the method par excellence for tinnitus. I have never known anything to compare with it. However, I am more partial to the bougie treatment. It is not quite so painful and you do not encounter the difficulties with it that you do with the applicator. There is the difficulty of always getting the applicator the same size. Sometimes you will wrap too much cotton on and sometimes you do not have enough on to do much good. Have you ever noticed that after you have sterilized the applicator and taken the cotton in your hand and tried to wrap it around the applicator tightly, you make it black? I am inclined toward the bougies.

I would like to say a word with reference to cocaineizing of the mouth of the Eustachian tube. I do not believe it is good practice, especially in inexperienced hands, because too much damage can be done the pharynx without objection from the patient. I prefer compressed air to the Politzer bag, since we cannot make pressure on the Politzer bag without moving the catheter at the same time and every ounce of force used at the distal end of the catheter is magnified at least ten times at the pharyngeal end, due to fulcrum action at the curve. Thus great damage can be done the mucosa, resulting occasionally in emphysema. With compressed air you can regulate the pressure without moving the catheter.

Dr. Coates mentioned the method I reported in Harrisburg, that is, the use of filiforms in the ear. Twenty-five years ago, when I was doing G. U. work, we used filiforms in the urethra. When I encountered tight strictures that I could not get through, my old G. U. practice came to mind and I thought I would try some filiforms in the Eustachian tubes. By passing three filiforms to the face of the stricture and trying one after the other, I was successful in getting through my first impassable stricture. I have yet to fail to get through stricture if sufficient care and time are taken. Yankauer's catheter is too small to permit passage of three filiforms so had one made, corresponding to No. 5 catheter. With this, whatever force is used is in the Eustachian tube and not in the catheter.

I believe that you should not use either the bougie or filiforms oftener than once a week, because you always have a swelling of the mucosa after treatment.

DR. MACKENZIE: The first requisite in the treatment of disease is the making of a correct diagnosis. It is surprising how often a mistake is made in a case of perceptive deafness. Many of them who reach us have been treated previously for obstructive deafness.

As for the treatment of the Eustachian tube and the nasopharyngeal space, Holmes was the gentleman who first brought out the nasopharyngoscope. We are also indebted to Yankauer for his valuable contributions. We are grateful also to Dr. Miller for bringing up this important subject for discussion this evening.

If I am not out of order I would like to refer to the particular method we practice in the treatment of the Eustachian tube in the cases of middle ear catarrh with strictures of the tube.

As a preliminary step in the treatment we apply cocaine solution on a Yankauer applicator, introduced into the Eustachian tube through a metal catheter. After about ten minutes' application of this kind we start to use the silk catheters of Yankauer and proceed to start with a No. 5 and reduce the size if we find that we must.

Strictures occur in the Eustachian tube in one of three places. Near the pharyngeal orifice at the isthmus, at the tympanic end of the Eustachian tube or at the pretympaum. It is this last mentioned location that we have found to be the most important. In my early experiences I found that the ordinary introduction of the bougie did not bring the desired results. It would seem as though we came up against a resistance in the region of the tympanum and for fear of doing damage to the ossicles I would stop, until one day a little bolder than usual, I passed the instrument for a millimeter or two beyond this resistance and found upon removing the instrument that the patient immediately remarked how much improvement she had experienced. This improvement was confirmed by a checkup on the functional tests. The excellent results obtained in this particular case prompted us to try it in other cases, and I am pleased to report that in practically all of the cases in which I found a marked obstruction about the tympanic orifice of the tube, in which I was bold enough to introduce the probe this extra millimeter or two, that the results have been satisfactory.

On the whole, I would like to endorse treatment of the Eustachian tube as the most promising form of treatment in selected cases of obstructive deafness.

DR. BARBITT: I do not wish to discuss this paper but simply to express my appreciation of it. It is very comforting to find from a good strong clinic of this sort, work going on which has had proven results. While we have belief in the procedure, the frequent lack of result almost raises the question of malingering.

It seems to me that the meat of this whole paper tonight lies in the positive emphasis that is placed on the time element in treatment. This is probably as important as the actual technique of procedure. It would hardly seem advisable to practice this procedure except during the hypertrophic stage. I would like to ask of the speaker if he will give a little more definite information as to the exact method used in intratubal treatment.

DR. GOWEN: From the infectious disease standpoint I would like to mention our routine at the Municipal Hospital, which, as a general proposition, is especially adapted to acute cases and particularly efficacious in children.

As the surface cavities of the body are the chief avenues of infection to the human organism, so is the Eustachian tube the avenue of infection to the ear. So, since disease in or at the tube is the cause of ear disease, then it would seem logical to treat the cause as well as the disease.

Measures that I use for treating these cases are: after establishing adequate ear drainage, depletion with calomel and salines, aeration with shrinking solutions, followed by antiseptic application or instillation of solutions to the tube orifice. The first supplies cold air to a warm, moist, dark breeding chamber for bacteria, tending to retard their growth. The second kills the bacteria *in situ*.

In addition, as soon as possible, the adenoids and tonsils should be removed and nasal diseases and their causes eliminated.

In closing my discussion, I would say where there is a nephritis or myocarditis or other serious complications in any patient, they are saved the shock of a mastoid operation with this treatment.

DR. WAGERS: Dr. Miller has given us a very complete description of this form of treatment. I would like to suggest, however, the use of the nasopharyngoscope to facilitate the introduction of the catheter into the mouth of the Eustachian tube in all cases in which there is difficulty and uncertainty in locating the tube by the usual method. In this way unnecessary irritation of the tubal orifice may be avoided.

DR. MILLER, in closing: As to the length of these treatments, I stated in the paper that the applicators were allowed to remain in position for 15 minutes to a half-hour. If you have time, and your patient has time, 45 minutes or even an hour is not too long to allow them to remain. I insert the applicators and allow the patient to sit in another room while I attend to other patients.

Dr. Coates spoke of the advisability of shrinking the nasal mucosa before catheterization. That is important and should have been mentioned in my paper as it is part of my routine technique. The shrinking allows more room for the catheter, gives clearer vision for insertion and also lessens the danger of traumatism.

Dr. Weider spoke of the difficulty in getting the same amount of cotton on the applicator each time. This is, I feel, simply a matter of practice and I do not find any great difficulty in getting just the amount of cotton I desire each time. For the first treatments I start with a small amount of cotton and as the dilatation increases I increase the amount of cotton and so increase the amount of pressure produced. This is on the same principle as the use of the graduated sizes of the bougies. I am very glad that Dr. Weider told us about the use of filiforms.

As to the frequency of treatments: Patients start with treatments twice a week. As progress is made the period is increased to one week, ten days, two weeks and so on. The frequency depends entirely upon the progress made and gain retained. Sometimes cases must be followed for many months. Cases following acute conditions respond more quickly. I do not find any difficulty in having patients return for treatments as often as I desire. When I began using this treatment I started patients out with one a week. As soon as I began with treatments twice a week the improvement was more rapid and more marked.

Dr. Mackenzie's point about obstructions in the pretyrpanum I think is excellent and will undoubtedly explain some of the failures in the use of this treatment. I have always hesitated, as he did, to enter the middle ear through the Eustachian tube and am glad to know that it can be done safely if proper care is used.

Dr. Babbitt asked about the medication used. For shrinking, 3 per cent solution of ephedrin of 10 per cent solution of cocain. For application after shrinking I usually use a 1 per cent solution of tincture of iodine in glycerin, though a 10-15 per cent solution of argyrol or a 2 or 5 per cent solution of silver nitrate may be used.

A Convenient Method of Shrinking the Sphenoid Drainage Area. Dr. Joel J. Pressman.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. ERSNER: I have had the privilege of watching some of the patients that Dr. Pressman spoke about. The greatest difficulty that we have to overcome is to control the gagging of the patient. This is readily accomplished by spraying cocaine to the soft palate and surrounding areas, after which the patient will permit you to do most anything. It is a simple method with no contraindications, therefore no harm can be done by employing it. Occasionally we just want to study the posterior sinus drainage; this method is therefore indicated. It is especially useful in fractured noses that we find in prizefighters or athletes, or badly deflected septa. Another indication is to employ it for posterior rhinoscopy. We must bear in mind not to use any more cocaine than is necessary because of susceptibility, habit formation, vasodilatation and impediment to ciliary motility. Why treat the entire nasal mucous membrane when you can just treat the posterior sinuses and obtain the same results?

In conclusion, by employing the method as outlined by Dr. Pressman we have a simple technique or procedure, that will be of therapeutic value in the daily routine in rhinosinusology.

DR. BRICKER: Dr. Pressman's method of applying medication to the posterior ethmoidal and sphenoidal areas is essentially an office procedure and it is rather difficult to have the patient in the office more than once or twice a day for treatment. I have been using a postural method, which accomplishes the same end and that can be carried out at the patient's home any number of times a day that it is necessary. That is, the patient is instructed to lie crossways on the bed and to extend his head as far backward over the edge of the bed as possible until the chin points toward the ceiling. About a half medicine dropper full of medication is instilled in each nostril and the position retained for about a minute. When the patient assumes the upright position there is a shower of the medication over the whole posterior and exterior walls of the pharynx.

DR. PRESSMAN, in closing: The question has been raised of difficulty of application of the method because of gagging. It is true in some cases that gagging is troublesome, but it can be largely overcome, as Dr. Ersner suggests, by a mild cocaine spray to the soft palate and adjacent parts, or by instructing the patient not to draw away when gagging occurs and utilizing the short interval between paroxysms, when the uvula drops to resting position for spraying the solution into the posterior nares.

Regular Meeting, Tuesday, Dec. 2, 1930.

CLINICAL NIGHT.

Report of a Case of Lateral Sinus Thrombosis Presenting Some Interesting Features. Dr. Louis Baer.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. WIEDER: About three weeks ago we encountered a case almost similar to the one reported. A colored girl, age about 13 years, came into the Graduate Hospital on Dr. Roberts' service, with a temperature of 104°. She had an acute flareup of a chronic otitis media with acute mastoid involvement, so we operated immediately. Owing to history of chill and high temperature we suspected lateral sinus thrombosis, so did a Toby test when she was under anesthesia. It was positive. During the operation we encountered a large perisinus abscess. We needed the sinus and failed to obtain blood. About that time the anesthetist said the patient was going bad, so we decided to do nothing further but to complete our operating at a future time. The patient never had another rise in temperature after that time. A week later we did a radical mastoid operation and the child left the hospital about a week or so after that.

We were dealing with an old mastoid condition with an aseptic thrombosis of long standing. Then she had a flareup with perisinus abscess and if she had not gone bad on the table, our next move would have been to lay open the entire sinus.

DR. EMBREY: I had a case similar to this, but not exactly like it. The sinus was involved but we simply packed it and left it open. The patient recovered very nicely.

DR. STOUT: Some years ago I happened to be in New York and I saw several cases of lateral sinus involvement; one in particular involved the sigmoid and up and backward toward the torcular. The operator did not tie off the internal jugular vein. He said that he felt the child, who was under 12 years of age, had a better chance if the internal jugular vein was left alone. I wrote him several weeks later and he answered that the child had made a good recovery. When the vein is completely obliterated and apparently an old process, it would be unwise to disturb the internal jugular. On the other hand, if the process is acute and the germs are either streptococcus or pneumococcus, tying the internal jugular is a life-saving procedure. Another complication of this case was the superimposed furunculosis.

Case Report: Perforating Tuberculous Ulcer of the Palate. Dr. David H. Solo.

(To appear in a subsequent issue of THE LARYNGOSCOPE.)

DISCUSSION.

DR. STOUT: I saw this patient in the Jefferson Clinic. The condition looked as if it might be luetic. It had the appearance and heavy odor that is often associated with luetic ulcerations. It was a huge perforation, larger than any tuberculous ulceration I have ever seen. I recall seeing quite a few while working at the Rush, Phipps, and the T. B. Department of the Philadelphia General Hospital. They usually were surface ulcerations, rarely perforating, and usually near the terminal stage of the general tuberculous process. I realize that every effort was made to detect syphilis and none was found in this case.

Case Presentation: Brain Abscess, with Recovery. Dr. Benj. H. Shuster.

The patient presented was a young man, age 28 years, who was operated on by Dr. Shuster about two years ago, when a brain abscess in the left temporosphenoidal lobe was found, which had spontaneously worked its way through the temporal bone and appeared as a swelling above and behind the left ear. The patient had had a simple mastoidectomy on this side about ten years ago and had no trouble with this ear since that time, except an occasional otorrhea. The only symptom which the patient presented during the last illness was pain in the head on the affected side and swelling. He was kept under observation for about a week in one hospital, where only local treatment was administered. The swelling having subsided a little, he was discharged as cured. The pain having recurred and the swelling again enlarged, the patient presented himself to Dr. Shuster. The only reason to decide for surgical interference was the presence of a fluctuating mass in the presence of an otorrhea, the thought being that it was a secondary flareup of the previous mastoiditis. The only slight suspicion that the condition might be one of brain abscess was aroused by the fact that a case once seen of a brain abscess with spontaneous rupture presented a similar swelling. That case presented definite symptoms of brain abscess. This patient, however, showed no symptoms.

A postauricular incision was made and pus was found, which was traced to an opening in the temporal bone above the ear, about the size of a nickel. The opening was greatly enlarged and a gauze drain was inserted into the necrotic looking region of the brain, from which pus issued. The surrounding skin wound was left wide open and the patient was put to absolute rest for about a month. He was fed and was not permitted to exert himself in bed for any reason without attendance. The drain was not disturbed for over a week but the external dressing was changed frequently and the external part of the wound was treated by Dakinization. Pieces of brain tissues gradually sloughed away, leaving a cavity about the size of a small walnut. At the bottom of this cavity was seen a small polyp, which apparently indicated the point of origin of the abscess as irrigation of the cavity at this time caused the solution to flow through the external auditory canal by way of the middle ear.

The patient in general made a good recovery and at present is able to go about his business. The skin wound inverted into the cavity and an opening

still remains, through which one can look into the cavity. There has been no collapse of the cavity as the surrounding capsule must be tough and fibrous. No attempt has as yet been made to cover the opening by a skin plastic for fear that disturbance of the surrounding area and the sealing off of a non-collapsed cavity may tend to set up a meningitis, while the patient in his present condition is probably safest in spite of the presence of a little opening above his ear.

Case Presentation: Slowly Healing Mastoid. Dr. Benj. H. Shuster.

The patient presented was a young girl, age 12 years. A simple mastoidectomy had been done about eight months ago. The patient apparently did well for about a week, when the sutures gradually broke away and the mastoid wound remained as a slowly granulating mass with no tendency to fill. The granulations appeared in large dirty gray globules and there was a profuse discharge.

For several weeks the auricle was markedly infiltrated and finally subsided. Then a glandular enlargement appeared in the neck below the mastoid wound, which finally broke down and is now suppurating. All methods of diagnosis were exhausted and nothing definite was found. Negative Wassermann and no response to antiluetic treatment. Tests for tuberculosis were also negative except a suspicious shadow in X-ray of the chest. All therapeutic agents were also exhausted with no avail. All suggested drugs were used, ultraviolet rays, X-ray exposure, Dakinization, internal medications were all employed. The best improvement so far obtained was from thorough drainage of the cervical glands, which are suspected to be tuberculous. Improvement is now taking place slowly. There were glands in the scalp surrounding the mastoid wound which broke down and suppurated. The skin of the scalp itself was attacked around the mastoid wound by an extending ulceration. Improvement is taking place very slowly and the only underlying cause that is suspected is tuberculosis.

Case Report: Fracture of Frontal Sinus and Ethmoid Through Dura, Orbit and Maxillary Sinus; Recovery. Dr. Joseph D. Seiberling.

(Appears in full in this issue of THE LARYNGSCOPE.)

Presentation of a Case of Recurrent Ranula. Dr. Arthur J. Wagers.

This young woman came to the Clinic at Jefferson Hospital a day or two ago. She complained of a swelling beneath the tongue in the right side. The same swelling had occurred on two previous occasions within the past eight months. It had disappeared spontaneously and there had never been any pain.

On examination, we now see a long, cyst-like formation in the floor of the mouth and corresponding to the course of Wharton's duct. It is barely possible to locate the papilla through which the orifice of Wharton's duct extends. I have been unable to introduce an exceedingly small bougie into this duct and as I was unable to express any fluid by pressure, it is evident that the orifice is now occluded, preventing the normal outflow of saliva and we have in effect a retention cyst.

DISCUSSION.

DR. SHUSTER: Has there been an X-ray examination of calculus?

DR. WAGERS: Sufficient time has not elapsed since seeing this patient to have an X-ray report. An X-ray study will be made. I was able to palpate the part carefully and could not detect anything suggesting the presence of a calculus. However, we do know that this is one of the most frequent causes of obstruction in Wharton's duct, and the fact that she has been relieved spontaneously on two previous occasions suggests the expulsion of such a body from the duct.

I am unable to say at this moment what the treatment will be in this case as much depends on whether or not the trouble is found to be due to a calculus. In any case, an effort will be made to find and effect the patency of the natural orifice.

